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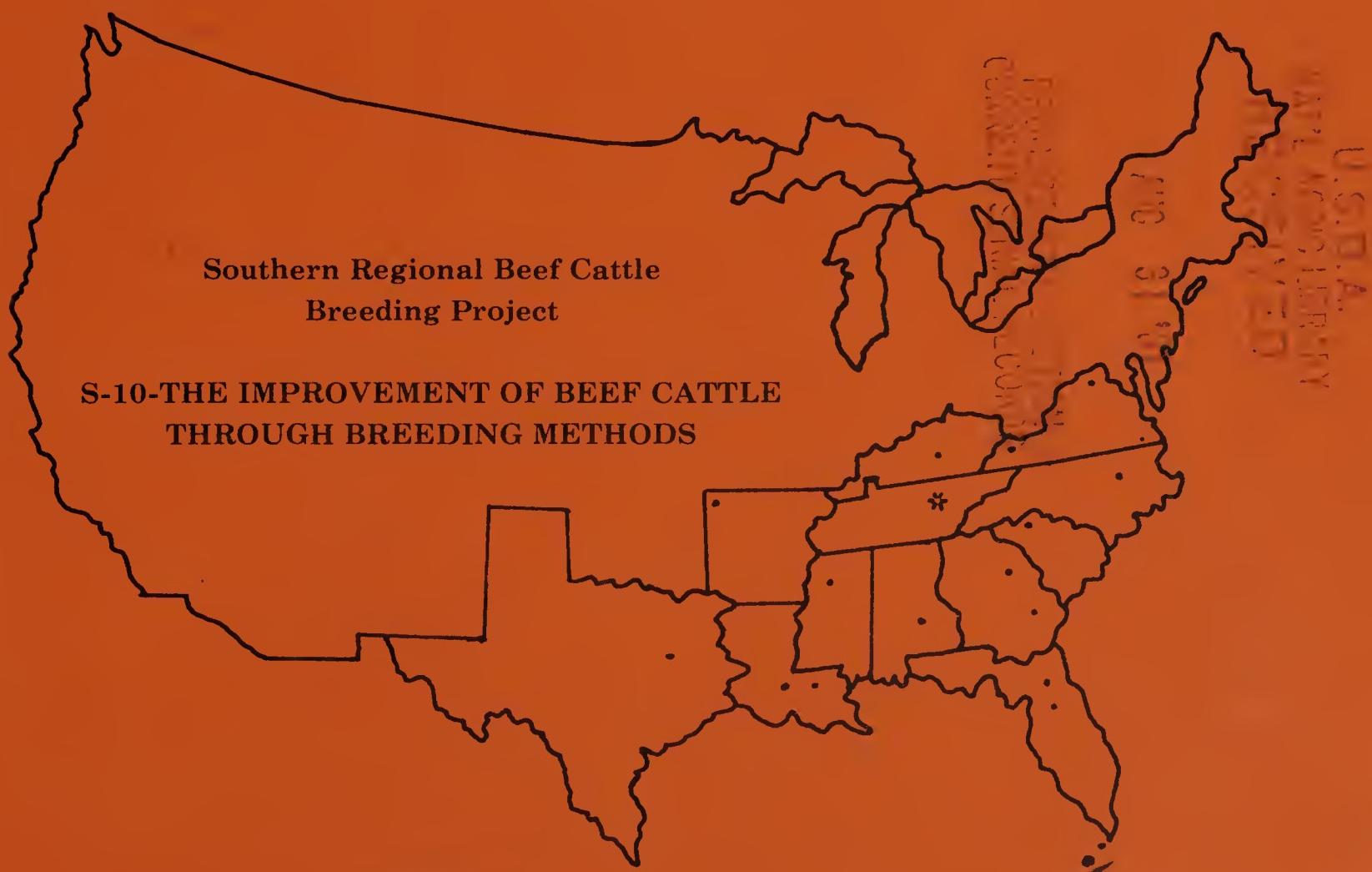
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E. J. Wernsing

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL SCIENCE RESEARCH DIVISION
and
COOPERATING SOUTHERN STATES

**1971-72 Annual Report of S-10
and
Report of Annual Technical Committee Meeting
Fayetteville, Arkansas
May 31-June 2, 1972**



This report is intended for the use of administrative leaders and workers
and is not for general publication.

S-10 - 1972 ANNUAL REPORT

CONTENTS

Introduction	1
1972 Minutes, S-10 Technical Committee Meeting	2
State Reports	5
Alabama	6
Arkansas	25
Florida	31
Florida, Brooksville	34
Georgia	35
Kentucky	44
Louisiana	51
Louisiana, Jeanerette	62
Mississippi	77
North Carolina	82
South Carolina	89
Tennessee	91
Texas	94
Virginia	125
Virginia, Front Royal	128

INTRODUCTION

This project was initiated in 1948 to investigate and develop methods of breeding more productive beef cattle for the South. Detailed annual reports showing research developments and progress in each state have been prepared each year since 1950. Complete results of certain phases of the project have been reported in regional bulletins and technical articles and bulletins published by workers in the various states which contribute to the S-10 project.

This publication includes the proceedings of the 1972 annual meeting of the S-10 Technical Committee and the annual reports of projects in each of the twelve contributing states. The annual reports of S-10 contributing and supporting projects were prepared by the project leaders and other personnel at the various stations as summaries of the research developments and progress at each station during 1971. The results are not considered final, but the materials aid cooperators in developing an integrated program. This report also provides information needed by heads of animal husbandry departments, experiment station directors, and U. S. Department of Agriculture officials for evaluation of the projects with respect to objectives and procedures. This report is not for general distribution and material contained in it should not be quoted in publications.

MINUTES OF S-10 TECHNICAL COMMITTEE MEETING

Fayetteville, Arkansas
May 31-June 2, 1972

The S-10 Technical Committee was convened by Chairman F. A. Thrift in the Animal Science Auditorium at 8:30 a. m. May 31, 1972. Dr. E. M. Cralley, Director, Arkansas Agricultural Experiment Station, welcomed the group to Arkansas. The program for the meeting is contained in the S-10 annual report.

The business session of the Technical Committee was convened by Chairman F. A. Thrift at 10:00 a. m. June 1, 1972. The following Technical Committeemen or their representative were present:

Alabama - T. B. Patterson, Auburn University, Auburn
Arkansas - C. J. Brown, University of Arkansas, Fayetteville
Florida - Marvin Koger, University of Florida, Gainesville
Georgia - H. D. Chapman, Coastal Plain Station, Tifton
Kentucky - F. A. Thrift, University of Kentucky, Lexington
Louisiana - J. W. Turner, Louisiana State University, Baton Rouge
Mississippi - Fay Hagan, Mississippi State University, State College
North Carolina - E. U. Dillard, North Carolina State University, Raleigh
South Carolina - W. C. Godley, Clemson University, Clemson
Tennessee - R. R. Shrode, University of Tennessee, Knoxville
Texas - T. C. Cartwright, Texas A & M University, College Station
Virginia - J. A. Gaines, Virginia Polytechnic Institute and State
University, Blacksburg
Administrative Advisor - Doyle Chambers, Louisiana State University,
Baton Rouge
Investigations Leader - W. T. Butts, AHRD USDA - University of
Tennessee, Knoxville

Dr. H. A. Fitzhugh, Texas A & M University, presented a new project proposal, "Evaluation of Hybrid Systems for Total Efficiency of Beef Production" for approval by the Technical Committee. Godley moved, Gaines seconded approval as the contributing project from the Texas Station.

Dr. W. T. Butts proposed research, to be conducted simultaneously at Brooksville, Florida, Front Royal, Virginia, and Jeanerette, Louisiana. No formal action was requested nor taken.

Dr. C. R. Long presented a brief report on research at the U. S. Meat Animal Research Center, Clay Center, Nebraska.

Dr. W. T. Butts, Investigations Leader S-10, presented his report. Reference was made to progress on regional publications including "Characterization of Breeds and Crosses of Beef Cattle". Also covered was direction of future research within S-10 framework.

Dr. Doyle Chambers, Administrative Advisor S-10, in his remarks discussed the relationship of regional research to administration and to other types of research.

Dr. Paul Putnam, USDA representative, discussed recent re-organization of Agricultural Research Service.

Dr. W. C. Godley was elected as the new member of the Executive Committee. Thus, the committee for the coming year will be:

T. B. Patterson - Chairman
C. J. Brown - Secretary
W. C. Godley

Dr. Jim Gaines issued invitation to meet in Virginia for the 1972-73 meeting. The approximate time for meeting is June 10, 1973. Gaines moved, Godley seconded to accept the invitation. The motion carried.

Dr. J. W. Turner presented the report of the Resolution Committee.

Whereas the 1972 S-10 Regional Beef Cattle Breeding Technical Committee meetings have been informative, broadening and enjoyable, the following resolutions are proposed:

- 1) Resolve to express the sincere appreciation of the S-10 Technical Committee to the University of Arkansas for hosting the 1972 meetings. Special recognition and appreciation is extended to Drs. C. J. Brown and J. E. Brown for developing, planning and executing a successful program.
- 2) Resolve to thank the Arkansas Cattlemen's Association and the Arkansas Agricultural Experiment Station and substation personnel for their support of the program and tour.
- 3) Resolve that personal letters of appreciation be prepared by the S-10 secretary for each of the following for their contributions to the 1972 S-10 Technical Committee meetings:
 - a. Dr. C. J. Brown
 - b. Dr. J. E. Brown
 - c. Dr. E. M. Cralley
 - d. Dr. D. L. Stephenson
 - e. Winrock Farms
 - f. Arkansas Cattlemen's Association
- 4) Whereas the S-10 Regional Beef Cattle Breeding Project has successfully completed 25 years of cooperative research effort, be it resolved that the following individuals be gratefully remembered for their roles and contributions:

Dr. Warren Gifford - Arkansas
Dr. C. S. Hobbs - Tennessee
Dr. R. E. Patterson - Texas
Mr. B. L. Southwell - Georgia
Prof. Z. A. Massey - Georgia
Dr. B. L. Warwick - Texas
Dr. H. A. Stewart - North Carolina
Dr. W. G. Kirk - Florida
Prof. E. G. Godby - South Carolina
Prof. H. H. Leveck - Mississippi
Dr. J. E. Foster - Maryland
Prof. W. D. Salmon - Alabama
Dr. A. E. Cullison - Alabama
Dr. C. M. Kincaid - Virginia
Dr. C. I. Bray - Louisiana
Dr. J. A. Whatley - Oklahoma
Dr. R. D. Lewis - Administrative Advisor - Texas

Turner moved, Godley seconded acceptance of report as read. The motion carried.

A moment of silence was observed in memory of Dr. C. S. Hobbs, Tennessee, and Dr. B. L. Warwick, Texas, both of whom are deceased.

The meeting was adjourned.

Respectfully submitted,

Troy B. Patterson, Secretary
S-10 Technical Committee

STATE REPORTS

AUBURN UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Hatch 219 (S-10)

The Effect of Environment, Genetic-Environmental Interaction and Heterosis on Performance of Beef Cattle

II. OBJECTIVES:

To evaluate the effect of environment and genetic progress under phenotypic selection.

To determine the effectiveness of selection for total performance in beef cattle.

To determine the influence of heterosis on rate of gain carcass quality and cow performance.

III. PERSONNEL:

T. B. Patterson and G. B. Meadows

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

The combination of land area, rainfall and long growing season which results in the production of abundant forage, makes the South-eastern United States well adapted to beef production. In order to maximize these natural advantages, there is a definite need for the improvement of the mean performance of beef cattle.

The differential response in various species of animals to their climatic environment has been adequately substantiated. Most of our present breeds of livestock were developed for adaptability to certain environmental conditions as well as to perform specific functions.

Presently beef cattle are being performance tested under specific conditions, while their progeny are expected to perform under a wide range of conditions. In theory, the measurable variance of different traits is composed of variance due to genetics, environment and their interaction. Only change in the additive fraction of the genetic variance results in permanent progress in response to selection. Nevertheless, the magnitude of the environmental and/or genetic-environmental fraction can definitely influence the effectiveness

of a selection program. Further by providing the optimum environment and by taking advantage of genetic-environmental interactions, higher production levels are possible.

There is need for additional research to determine the effectiveness of selection for total performance in beef cattle. In essence, information is needed to test whether the apparently large additive genetic variance, as determined by heritability estimates, can actually be exploited in a program of mass selection.

Heterosis is the increased vigor often exhibited by progeny from the mating of two distinct families, breeds or species. Livestock do not possess, to an equal degree, the adaptability of plans to a breeding program that permits maximum utilization of hybrid vigor. Nevertheless, the superior performance of breed crosses of swine indicates the need for additional research to determine the value of such a breeding method with beef cattle. This is particularly true with reference to the effect of heterosis on mothering ability and on progeny from a continuous crossbreeding program.

Purebred herds of the Angus and Hereford breeds located at the Beef Cattle Research Unit, Auburn University, provided the foundation stocks for this study. Each breed was divided into high and low performance groups based initially on previous record, where available, and on a performance index where previous record was not available. These groups were sub-divided into two equal groups, again based on previous record or index. Thus, there are two high and two low performance groups for each breed. This makes a total of eight herds. One high and one low performance herd of each breed was assigned to each of two nutritional regimes.

Winter feeding levels are the same for all eight herds. However, the high nutritional groups are placed on the best legume pastures in the spring while the low nutritional groups remain on silage until grass pastures are available. In addition the calves in the high nutritional groups are given access to a creep feed which is high in protein and low in carbohydrates. No other environmental differences are imposed on the two nutritional groups.

After weaning, all cows are subjected to similar management conditions. All calves are handled alike on post-weaning test. Replacements are selected by index within groups.

Data collection include birth weight, weaning weight (250 day) weaning score, finish score, ultrasonic fat thickness, post-weaning gain (140 days for bulls and 120 days for heifers), final score, final finish score, final ultrasonic fat thickness and weight of bulls at 400 ± 15 days.

Cows produced in a previous crossbreeding study have been used to study the effect of heterosis on mothering ability in beef cows.

These cows include purebred Angus, Hereford and Shorthorn cows bred to produce two-breed cross calves and two-breed cross bred cows from among the same breeds bred to the third breed to produce three-breed cross calves. Thus, comparisons are made between two-breed cross calves nursing purebred cows and three-breed cross calves nursing crossbred cows. Pre- and post-weaning performance data were obtained on all calves. In addition all steer calves were slaughtered and complete carcass information obtained.

2. Research results.

Five calf crops have been carried through post-weaning performance. These data have been summarized in appendix Tables 1-5. Results are reported across breed and/treatment groups. However, they are reported separately by sex of calf since the level of nutrition and length of the post-weaning feeding period were different for the two sexes. Table 1 shows the effect of level of nutrition on performance of bull calves. The difference of 72 lbs. at weaning between the high and low bulls is consistent with previous years. Compensatory gain continues to be evident since the low bulls gained 0.08 lbs. per day faster post-weaning than the high bulls. However, the final WDA was still greater (0.17 lb.) for the high bulls. Comparable differences are shown for heifers even though they were on a lower post-weaning nutrition level, Table 2.

The effects, as indicated by differences between high and low genetic level, were smaller than those of the nutrition level for both bulls and heifers, Tables 3 and 4. However, the differences were consistent for the two sexes and whereas, the low nutrition calves showed compensatory gain, the low genetic cattle continued to gain at a lower rate post-weaning.

The effect of pre-weaning nutrition level on reproduction in young cows is shown in Table 5. The differences were not as great for the last two years compared to the first two years largely because of differences in feed consumed. Sorghum silage was fed the last two years and intake was not great enough to support adequate growth in either group. There is no evidence to indicate a carry-over effect of either nutrition or genetics on reproduction in the mature cows.

Calves on the high nutrition level gained faster from birth to weaning while the calves on the low level of nutrition gained faster post-weaning. However, WDA favored the high level calves. Replacement females from the high level groups had higher reproductive rates as two and three year olds. The calves from the high genetic parents grew faster both pre- and post-weaning than calves from low genetic parents. These differences in weaning weights and post-weaning gains were smaller than the differences between the nutrition groups. There

was no evidence that genetic groups affected reproduction at any age studied.

TABLE 1. THE EFFECT OF PRE-WEANING NUTRITION ON THE PERFORMANCE OF BULL CALVES. FIVE YEAR AVERAGE.

	Nutrition Level		
	High	Low	Difference
Number of bulls	178	158	20
Avg. adjusted weaning wt., lbs.	552	480	72
Avg. post-weaning ADG, lbs.	2.54	2.62	-0.08
Avg. final WDG, lbs.	2.31	2.14	0.17
Avg. final score	13.3	12.8	0.5
Avg. index	111.5	105.2	6.3

TABLE 2. THE EFFECT OF PRE-WEANING NUTRITION ON THE PERFORMANCE OF HEIFER CALVES. FIVE YEAR AVERAGE.

	Nutrition Level		
	High	Low	Difference
Number of heifers	170	203	-33
Avg. adjusted weaning wt., lbs.	538	477	61
Avg. post-weaning ADG, lbs.	0.95	1.03	-0.08
Avg. final WDA, lbs.	1.51	1.40	0.11
Avg. final score	12.7	12.4	0.3
Avg. index	96.7	90.6	6.1

TABLE 3. THE EFFECT OF HIGH AND LOW GENETIC LEVEL ON THE PERFORMANCE OF BULL CALVES. FIVE YEAR AVERAGE.

	Genetic Level		
	High	Low	Difference
Number of bulls	170	166	4
Avg. adjusted weaning wt., lbs.	525	505	20
Avg. post-weaning ADG, lbs.	2.61	2.54	0.07
Avg. final WDA, lbs.	2.25	2.19	0.06
Avg. final score	13.1	12.9	0.2
Avg. index	109.5	106.6	2.9

TABLE 4. THE EFFECT OF HIGH AND LOW GENETIC PARENTS ON THE PERFORMANCE OF HEIFER CALVES. FIVE YEAR AVERAGE.

	Genetic Level		
	High	Low	Difference
Number of heifers	195	178	17
Avg. adjusted weaning wt., lbs.	511	497	14
Avg. post-weaning wt., lbs.	1.02	0.96	0.06
Avg. final WDA, lbs.	1.48	1.42	0.06
Avg. final score	12.6	12.5	0.1
Avg. index	94.4	92.0	2.4

TABLE 5. THE EFFECT OF HIGH AND LOW PRE-WEANING NUTRITION LEVEL ON THE REPRODUCTIVE PERFORMANCE OF TWO AND THREE YEAR OLD FEMALES. FOUR YEAR AVERAGE.

	Nutrition Level		
	High	Low	Difference
Number and percent calving at two years	79.4 (81/102)	72.3 (81/112)	7.1
Number and percent born dead	12.5 (10/81)	14.8 (12/81)	-2.3
Number and percent calving at two years that calved at three years	91.9 (57/62)	66.7 (28/42)	25.2

V. FUTURE PLANS:

The project will be continued as outlined.

VI. PUBLICATIONS DURING THE YEAR:

Patterson, T. B., J. T. Cope, W. W. Cotney and R. A. Moore. 1971. Performance of progeny sired by high and low performing beef bulls. Auburn Univ. (Ala.) Agr. Exp. Sta. Bull. 418.

VII. PUBLICATIONS PLANNED:

Experiment Station Bulletin, "Crossbreeding among the British breeds of beef cattle." (In press).

AUBURN UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Animal Science 4-016

A Comparison of Crossbreeding and Within Breed Selection on Beef Cattle Production in the Black Belt Area of Alabama

II. OBJECTIVES:

To evaluate the significance of hybrid vigor in various crosses of beef cattle with regard to production of slaughter calves, stocker or feeder steers and slaughter steers.

To determine the effect of heterosis on mothering ability, adaptability and fertility.

III. PERSONNEL:

T. B. Patterson, L. A. Smith and Harold Grimes.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

Crossbreeding, especially the effects on reproduction and mothering ability, have not been studied sufficiently. Recent increases in production costs and average lower prices received for cattle have resulted in many beef cattle producers making little or no profit. Obviously, these producers must either cut expenses and/or increase production per brood cow with little increase in cost of operation.

Mature Hereford and 1/2 Angus-1/2 Hereford cows were divided into similar groups on the basis of breed and previous performance. One group was bred to a Hereford bull and the other group to a Charolais bull. Cows were rotated each year to further minimize cow differences between groups. Thus, four groups of calves are produced each year, namely: (1) Hereford, (2) 3/4 Hereford-1/4 Angus, (3) 1/2 Charolais-1/2 Hereford, and (4) 1/2 Charolais-1/4 Angus-1/4 Hereford. Most of these calves are born in late fall and early winter. After two years, two different bulls, one Hereford and one Charolais, were obtained and the above process repeated.

All calves are creeped until pasture is available in the spring. Additional creep is used only when pasture conditions are such that

supplemental feeding becomes necessary to maintain normal growth. Environmental differences between groups are minimized by pasture rotation on a regular basis.

Birth weights, weaning weights, slaughter and feeder grades are recorded.

At weaning the steer calves go directly to the feedlot where they are fed by breed groups to an average shrunk weight of approximately 1,000 pounds for the Hereford and Hereford x Angus-Hereford and approximately 1,150 pounds for the Charolais crosses. The steers are marketed by breeding groups as they reach the desired market weight. Data collected includes feedlot gain, feed efficiency, complete slaughter data and a tenderness evaluation on the basis of two-inch rib sample taken from the left side at the 12th rib.

2. Research results

Four calf crops have been weaned and the steers from three crops finished in the feedlot and carcass data obtained. The percent calf crop weaned and weaning weights and grades are shown in Table 1. The influence of heterosis on percent calf crop is seen when straight Hereford cows are compared to the crossbred Angus-Hereford cows. Percent calf crop weaned is higher when either group of cows is bred to Hereford bulls compared to Charolais bulls. However, the calves by Charolais bulls gained faster and weighed approximately 80 pounds more at weaning than the Hereford sired calves.

The Charolais sired steers gained faster in the feedlot and had a higher weight per day of age at slaughter than the Hereford sired steers (Table 2). Compensatory gain was evident in that steers out of straight-bred cows gain as fast as or faster than steers sired by the same bulls but out of crossbred cows.

At slaughter steers by Charolais bulls had heavier carcasses with less external fat and had more lean as measured by yield grade than carcasses from Hereford sired steers (Table 3). There was no difference in quality grade associated with breed of sire. Carcasses from steers out of Hereford cows tended to have less fat and lower quality grades than those from the crossbred cows.

On the basis of this limited sample, Charolais bulls (only two bulls) settle fewer cows than Hereford bulls. However, Charolais sired calves grow faster and produce leaner carcasses with equal quality grades.

TABLE 1. PERCENT CALF CROP WEANED, WEANING WEIGHTS, WEANING GRADES AND POUNDS OF CALF WEANED PER COW BRED.
FOUR YEAR AVERAGE.

Breed of bulls	Hereford	Hereford	Charolais	Charolais
Breed of cows	Hereford	$\frac{1}{2}$ Angus $\frac{1}{2}$ Hereford	Hereford	$\frac{1}{2}$ Angus $\frac{1}{2}$ Hereford
No. of cows	55	62	48	55
No. of calves	48	58	35	42
Percent weaning calf	87.3	93.5	72.9	76.4
Avg. adj. weaning wt., lbs.	555	583	637	662
Avg. lbs. calf per cow bred	484	545	464	506
Avg. stocker grade	13.5	13.7	14.3	14.3

TABLE 2. FEEDLOT PERFORMANCE.
FOUR YEAR AVERAGE.

	Breeding of Steers			
	Hereford	3/4 H	1/2 C	1/2 C
		1/4 A	1/2 H	1/4 A
No. of steers	20	26	24	22
Avg. days on feed	162	166	180	159
Avg. final wt., lbs.	1003	1020	1134	1122
Avg. daily gain, lbs.	2.50	2.49	2.73	2.73
Avg. WDA, lbs.	2.31	2.30	2.54	2.57
Avg. final slaughter grade	13.0	13.4	12.3	12.4
Avg. final wt./cow bred	876	954	827	857

TABLE 3. CARCASS DATA
FOUR YEAR AVERAGE

	Breeding of Steers			
	Hereford	3/4 H	1/2 C	1/2 C
		1/4 A	1/2 H	1/4 A
No. of steers	20	26	24	22
Avg. hot carcass wt., lbs.	590	603	687	683
Avg. carcass WDA, lbs.	1.39	1.40	1.57	1.61
Avg. ribeye/cwt. carcass, sq. in.	2.00	2.06	2.30	2.30
Avg. backfat/cwt. carcass, in.	0.09	0.11	0.05	0.06
Avg. yield grade	3.2	3.6	2.5	2.6
Avg. quality grade	11.7	12.6	11.8	12.2

V. FUTURE PLANS:

Project will be terminated effective June 30, 1972, and replaced by new project.

VI. PUBLICATIONS DURING THE YEAR:

Collins, J. C., T. B. Patterson, W. M. Warren, L. A. Smith and Harold Grimes. 1972. Crossbreeding beef cattle. Auburn Univ. (Ala.) Agr. Exp. Sta. Bull. 433.

VII. PUBLICATIONS PLANNED:

Bulletin on last four years' results.

I. PROJECT: Animal Science 4-017

The Effects of Breed and Breed Crosses on Milk Production and on Other Production Factors in a Grade Beef Herd

II. OBJECTIVES:

To determine the effect of Brown Swiss, Holstein and Charolais breeding on (a) milk production, (b) weaning weights and grades, (c) feedlot performance, and (d) carcass desirability.

III. PERSONNEL:

T. B. Patterson and R. A. Moore

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

Many of the commercial beef herds in the Southeast were established with common cows of predominately dairy breeding as foundation females. Purebred beef bulls were used in a grading-up process. Most of the build up in numbers and subsequent grading-up process occurred within the past 15-20 years when market price and demand favored a so called "milk-fat calf". Consumer preference has changed over the past five to ten years to a demand for heavier beef. Nevertheless, most commercial producers in Alabama still market their calves at weaning, and total weight and price per cwt. determine gross receipts.

In the opinion of many commercial breeders there is an apparent reduction of milking abilities of brood cows associated with the grading-up process. Milk is the most important source of quality nutrients in the diet of the beef calf. Producers are faced with the choice of reverting to the original type cows that are often lacking in beef conformation and/or inherent ability to gain, or attempting to improve milk production within the existing herd through phenotypic selection. Obviously, improvement in milk production can be accomplished most rapidly through the use of selected sires since a sire constitutes roughly one-half of the genetic make-up of the herd.

Seventy-five grade beef cows were divided into similar groups of 25 each on the basis of age, breeding, and previous production record each year. They were bred to Hereford (control), Brown Swiss and Charolais bulls. The bulls were changed each year. A group of Holstein and Holstein-Jersey cows were bred to the Hereford bulls.

Additional information such as milk production of the original cows at 90 and 250 days of lactation was established. Production information on all calves to weaning can be related to milk production of their dams. Post-weaning performance and carcass data on all steer calves provided information of the effects of breeding on production.

All physically sound heifers produced by the procedure described above have been retained until approximately 25 breeding age females per breeding group were available. These heifers were bred to closely related Hereford bulls selected from a high producing herd. Only bulls with above average weaned weights were considered. Milk production obtained from this set of females will provide a comparison with the original and with subsequent herd milk production levels. Milk production and breed of dam is confounded; however, differences in calf-weaned weights reflects these two important brood cow characteristics.

All steer calves are full fed on corn silage plus supplement until they have reached 1,000 lbs. and average in the Choice grade. Carcass data are obtained on all steers. As before, all physically sound heifers are retained as replacements for the next generation.

2. Research results.

Four calf crops have been produced out of the first generation cows. The steer calves were fed out, slaughtered and carcass data obtained.

Replacement females have been retained as second generation cows. These cows have produced their second calf crop sired by the second group of Hereford bulls.

Reproductive performance and birth weights for the first four years are shown in Table 1. The 1/2 Brown Swiss-1/2 Hereford cows weaned a significantly higher percentage of calves than the other groups. The Hereford calves averaged significantly smaller than the other calves. There was no difference in stocker grade.

There was no difference in gain in the feedlot for the four groups of steers (Table 2). Differences that were present at weaning were also present at slaughter. There were few differences between carcass traits among the four groups (Table 3). The part Charolais steers were leaner and had larger ribeyes. There was no difference in carcass grades.

The first set of calves produced from the second generation cows have been weaned and steers finished in the feedlot. Reproductive and weaning data for the one year are shown in Table 4, feedlot performance in Table 5, and carcass data in Table 6. Numbers are small; therefore, no conclusions are drawn.

The fourth and final calf crop for generation one cows has been weaned and the steer calves finished in the feedlot. Heterosis and/or milk production continue to affect weaning weights. The straight Hereford calves are smaller at weaning, at slaughter and produce smaller carcasses than calves from either of the crossbred groups. The first calf crop from the second generation cows has been weaned and the steers finished in the feedlot.

TABLE 1. REPRODUCTIVE PERFORMANCE, WEANING WEIGHTS
AND WEANING GRADES FOR FIRST GENERATION COWS.
FOUR YEAR AVERAGE.

	Hereford	Breeding of Cows		
		1/2 Here 1/2 Char	1/2 Here 1/2 BS	1/2 Hols 1/2 Here
No. of cows	70	79	72	70
No. of calves	54	63	64	53
Percent weaning calf	77.1	79.7	88.9	75.7
Avg. adj. weaning wt., lbs.	459.6	526.2	554.5	551.5
Avg. lbs. calf per cow bred	354.4	419.4	493.0	417.5
Avg. stocker grade	12.4	12.7	12.1	12.6

TABLE 2. FEEDLOT PERFORMANCE.
FOUR YEAR AVERAGE.

	Hereford	Breeding of Steers		
		3/4 Here 1/4 Char	3/4 Here 1/4 BS	3/4 Here 1/4 Hols
No. of steers	28	34	33	32
Avg. initial wt., lbs.	541	576	604	612
Avg. ADG, lbs. (231 days)	1.79	1.80	1.78	1.69
Avg. final shrunk wt., lbs.	954	991	1015	1002
Avg. slaughter grade	12.4	11.2	11.5	12.0

TABLE 3. CARCASS DATA.
FOUR YEAR AVERAGE.

	Breeding of Steers			
	Hereford	3/4 Here	3/4 Here	3/4 Here
	1/4 Char	1/4 BS	1/4 Hols	
No. of steers	28	34	33	32
Avg. hot carcass wt., lbs.	576	603	616	634
Avg. rib fat, in	0.43	0.32	0.39	0.36
Avg. ribeye area, sq. in	10.3	11.1	10.7	10.8
Avg. quality grade	12.2	11.8	11.9	12.0
Avg. yield grade	3.0	2.7	3.1	3.1

TABLE 4. REPRODUCTIVE PERFORMANCE, WEANING
WEIGHTS AND WEANING GRADES FOR SECOND GENERATION COWS.
ONE YEAR.

	Breeding of Cows			
	Hereford	3/4 Here	3/4 Here	3/4 Here
	1/4 Char	1/4 BS	1/4 Hols	
No. of cows	10	13	11	16
No. of calves	7	11	10	15
Percent weaning calf	70.0	84.6	90.0	93.8
Avg. adj. weaning wt., lb.	470	494	512	504
Avg. lbs. calf per cow bred	329	418	465	473
Avg. stocker grade	12.4	13.0	12.6	12.6

TABLE 5. FEEDLOT PERFORMANCE. ONE YEAR.

	Breeding of steers			
	Hereford	7/8 Here	7/8 Here	7/8 Here
	1/8 Char	1/8 BS	1/8 Hols	
No. of steers	3	9	4	5
Avg. initial wt., lbs.	422	503	576	515
Avg. ADG, lbs. (228 days)	1.97	1.91	1.89	2.02
Avg. final shrunk wt., lbs.	872	939	1008	975
Avg. slaughter grade	12.0	12.7	13.2	13.0

TABLE 6. CARCASS DATA
ONE YEAR

	Breeding of Steers			
	Hereford	7/8 Here 1/8 Char	7/8 Here 1/8 BS	7/8 Here 1/8 Hols
No. of steers	3	9	4	5
Avg. hot carcass wt., lbs.	543	592	634	621
Avg. rib fat, in	0.43	0.49	0.48	0.50
Avg. ribeye area, sq. in	10.2	10.5	10.2	10.6
Avg. quality grade	10.7	12.1	11.5	12.2
Avg. yield grade	2.8	3.2	3.5	3.4

V. FUTURE PLANS:

The project will be continued as outlined.

VI. PUBLICATIONS DURING THE YEAR:

Patterson, T. B., W. W. Cotney and R. A. Moore. 1972. Brown Swiss, Charolais and Hereford Breeding in a Grade Beef Herd - Effect on Performance and Carcass Characteristics. Auburn Univ. (Ala.) Agr. Exp. Sta. Bull. 430.

VII. PUBLICATIONS PLANNED:

Circular on second phase of this study.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Alabama

Location	Auburn	Auburn	Auburn	Auburn
Breed of sire	Angus	Angus	Angus	Angus
Breed of dam	Angus	Angus	Angus	Angus
Line or group ¹	ER GI	EI GII	EII GI	EII GII
Percent used in project	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	37	37	42
	Yearling heifers	8	5	8
	Bulls and steers under 1 year	16	20	25
	Heifers under 1 year	15	14	15
	Bulls over 1 year	2	2	2
	Steers over 1-year	0	0	0
	Percent pregnant ²	80.0	85.4	93.2
Repro. perf.	Calf survival percent ³	96.9	97.1	97.6
	Adj. ADG ⁴	2.02	1.88	1.69
Wean. perf.	Ave. type sc. ⁵	13.5	13.3	13.0
	No. of bulls	13	16	10
Postweaning performance	No. of heifers	14	7	18
	No. of steers	4	2	0
	No. of bulls	0	0	0
Slaughtered performance	No. of heifers	0	0	0
	No. of steers	4	2	0
				2
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: (To steer and mature dam).

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 -72

State Alabama

Location	Auburn	Auburn	Auburn	Auburn
Breed of sire	Hereford	Hereford	Hereford	Hereford
Breed of dam	Hereford	Hereford	Hereford	Hereford
Line or group ¹	EI GI	EI GII	EII GI	EII GII
Percent used in project	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	37	27	33
	Yearling heifers	5	8	3
	Bulls and steers under 1 year	15	12	18
	Heifers under 1 year	16	9	11
	Bulls over 1 year	2	2	2
	Steers over 1-year	0	0	0
Repro. perf.	Percent pregnant ²	83.3	75.8	84.2
	Calf survival percent ³	91.4	92.0	87.5
Wean. perf.	Adj. ADG ⁴	1.74	1.76	1.38
	Ave. type sc. ⁵	13.0	13.0	12.0
Postweaning performance	No. of bulls	14	7	14
	No. of heifers	16	12	10
	No. of steers	0	1	1
Slaughtered performance	No. of bulls	0	0	0
	No. of heifers	0	0	0
	No. of steers	0	1	1
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: (To steer and mature dam).

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Alabama

Location	UCPSS Winfield	USPSS Winfield	UCPSS Winfield	UCPSS Winfield	
Breed of sire	Hereford	Hereford	Hereford	Hereford	
Breed of dam	Hereford	3/4 Hereford 1/4 Br Swiss	3/4 Hereford 1/4 Holstein	3/4 Hereford 1/4 Charolais	
Line or group ¹	Grade	Backcross	Backcross	Backcross	
Percent used in project	100	100	100	100	
Inventory as of July 1,	Cows 2 years and over	14	20	18	22
	Yearling heifers	6	9	1	5
	Bulls and steers under 1 year	8	8	5	9
	Heifers under 1 year	7	11	12	9
	Bulls over 1 year	3	-	-	-
	Steers over 1-year	0	0	0	0
Repro. perf.	Percent pregnant ²	100.0	95.2	94.4	87.0
	Calf survival percent ³	93.8	95.0	100.0	90.0
Wean. perf.	Adj. ADG ⁴	1.66	1.81	1.77	1.73
	Ave. type sc. ⁵	12.4	12.6	12.6	13.0
Postweaning performance	No. of bulls	0	0	0	0
	No. of heifers	0	0	0	0
	No. of steers	3	4	5	9
Slaughtered performance	No. of bulls	0	0	0	0
	No. of heifers	0	0	0	0
	No. of steers	3	4	5	9
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments: (To steer and mature dam).⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Alabama

Location	BBSS Marion Jct.	BBSS Marion Jct.	BBSS Marion Jct.	BBSS Marion Jct.
Breed of sire	Hereford	Hereford	Charolais	Charolais
Breed of dam	Hereford	$\frac{1}{2}$ Angus $\frac{1}{2}$ Hereford	Hereford	$\frac{1}{2}$ Angus $\frac{1}{2}$ Hereford
Line or group ¹	Grade	Backcross	Cross	Cross
Percent used in project	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	0	0	0
	Yearling heifers	0	0	0
	Bulls and steers under 1 year	0	0	0
	Heifers under 1 year	0	0	0
	Bulls over 1 year	0	0	0
	Steers over 1-year	0	0	0
Repro. perf.	Percent pregnant ²	-	-	-
	Calf survival percent ³	-	-	-
Wean. perf.	Adj. ADG ⁴	-	-	-
	Ave. type sc. ⁵	-	-	-
Postweaning performance	No. of bulls	-	-	-
	No. of heifers	6	3	1
	No. of steers	3	5	7
Slaughtered performance	No. of bulls	0	0	0
	No. of heifers	0	0	0
	No. of steers	3	5	7
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF ARKANSAS
Agricultural Experiment Station
Fayetteville, Arkansas

I. PROJECT: Hatch 170

Evaluation of performance records of beef cattle.

II. OBJECTIVES:

Continue to develop practical but adequate methods for identifying, evaluating and propagating the genetic potential for the production of beef.

III. PERSONNEL:

C. J. Brown, J. E. Brown, R. S. Honea and L. O. Brown

IV. ACCOMPLISHMENTS DURING THE YEAR:

At the Main Experiment Station, purebred herds of Angus, Hereford and Polled Hereford herds as indicated in the project outline and inventory were made. Preweaning and postweaning growth and related information were recorded on males and females. Bulls were individually fed and females were group fed on pasture.

At the Main Experiment Station, a four year experiment in which Hereford, Angus, Charolais and Santa Gertrudis bulls were mated to Hereford and Angus cows is nearing completion. The summary of the preweaning phase is attached. Steers from the last calf crop are being fed to 1000 pounds and carcass data will be summarized on this phase at the end of the feeding period this year.

At the Pinetree Land Use Project, the cattle have been assembled for the crossbreeding study in which 150 Hereford, Angus and Hereford x Angus cows will be mated to Charolais and Santa Gertrudis bulls in the fall of 1972. These crosses will permit further comparison of bulls of these two breeds, evaluation of heterosis of maternal ability in the Hereford x Angus crossbred cow and comparison of straightbred, single cross and three-way cross calves as contemporaries. Also at this location, matings have been made and calves are on the ground to study the results of criss x cross matings of Red Poll x Hereford, Red Poll x Angus, Brown Swiss x Hereford, Brown Swiss x Angus and matings will be made this fall with Holstein x Hereford and Holstein x Angus.

From the data accumulated in the purebred herds between 1950-1967, lifetime weight-age curves were computed for 288 Hereford and 296 Angus females and 26 herd sires. The equation $Y_{it} = A_i (1-B_i e^{-Kt}) + e_{ijt}$ described by Brody (1945) was used to determine the weight-age curve of each individual. Genetic environmental relationships among growth curve characteristics and various measures of development have been studied.

The results of these studies have led to a series of publications dealing with a description of cattle growth and relationships among various measures of growth. The impact of the development pattern on performance, testing procedures, reproduction and cow maintenance costs have been explored. The following potential applications have evolved from these considerations:

A. There was sufficient variation in the growth patterns between and within breed groups examined to indicate the necessity of considering differences in physiological age of animals at the time of evaluation.

B. The various patterns of growth observed indicate that single measures of weight or gains made at only a few ages prior to 15 months are not sufficient to identify an individual's growth pattern. It may be useful to know 205- or 365- day weight but such single measures are not indicative of the lifetime weight-age relationship. Neither mature weight nor rate of maturing can be accurately predicted using any one measure prior to 15 months. This does not mean that a series of weights, gains and skeletal measures cannot be used to accurately predict mature weight and rate of maturing. Measurements at a constant degree of maturity are useful in evaluating the growth characteristics of an animal. An injustice occurs in testing and evaluation procedures based on constant age because of the large differences that exist in degree of maturity. The primary argument for age-constant evaluations is that extensive management and economic decisions are made on an age basis. Some of these decisions could be made more efficiently on a physiological-age basis if the physiological age of an animal could be determined.

C. The use of similar mechanical selection procedures for the same traits will not effect the same genetic change in growth patterns of the various breed groups.

D. Emphasis on weight will not cause the same genetic changes in the growth pattern of cattle as will selection for gain or selection for weight and gain together.

E. The interrelationships between mature size, immature weights, gain and maturing rate suggest a need to reconsider the practice of selecting males and females for the same traits. It would be well to

consider the consequences of selection for large weights and gains on mature weights and rate of maturing. The producer must decide if it is economically efficient for him to increase growth rate in slaughter cattle at the expense of increasing mature size of females retained for breeding, which may increase his cost of producing a pound of calf.

F. The large amount of variation in rate of maturing and mature weight existing in these two herds points out the possibility of developing lines with specific growth patterns within the various breeds. Breeders have the genetic raw material at hand to create various types of growth patterns, enabling commercial cattlemen to seek optimum sire-dam combinations for their respective situations. Efficient combinations may be arrived at through either crossbreeding or line crossing. If sufficient data were available to compute growth patterns of the mature animals in breeding herds, bulls and cows could be matched to maximize efficiency of production. Although it is sometimes implied, only infrequently are conscious efforts made to combine animals so that strengths and weaknesses in a variety of traits complement each other in the two sexes. Information on lifetime growth characteristics of sires and dams would permit the producer to devise a more efficient grouping for producing nonbreeding animals for feeding and slaughter and also permit the development of more knowledgeable management programs for animals kept for breeding.

V. PUBLICATIONS: Bulletins and Journal Papers

Brown, J. E., C. J. Brown and W. T. Butts. 1972. A discussion of the genetic aspects of weight, mature weight and rate of maturing in Hereford and Angus cattle. *J. Anim. Sci.* 34:325.

Brown, J. E., C. J. Brown and W. T. Butts. 1972. Relationships among weights, gains and rate of maturing in cattle. (Submitted *J. Anim. Sci.*- Accepted for Sept. issue).

Brown, C. J., J. E. Brown and W. T. Butts. 1972. Analysis of body weight and age at fixed levels of maturity. (Submitted *J. Anim. Sci.*)

Brown, J. E., C. J. Brown and W. T. Butts. 1972. Relationships among measures of growth from birth to maturity in Hereford and Angus cattle. *Ark. Exp. Sta. Bull.* 773.

Brown, C. J. and J. E. Brown. 1972. The influence of mature weight and rate of maturing on individual beef cow efficiency. *Ark. Exp. Sta. Bull.* 774.

Brown, C. J., Carl Lueker and L. O. Brown. 1971. Performance of bulls on Arkansas Cooperative Beef Bull performance. Test. No. 9. *Ark. Agric. Exp. Sta. Rpt. Series* 195.

Morrow, Ronald E. 1972. The relationship of certain blood serum enzymes to rate of gain and carcass characteristics in crossbred beef steers. M. S. Thesis. Univ. of Ark. Library.

PUBLICATIONS: Abstracts of Papers Presented

Brown, J. E., C. J. Brown and W. T. Butts. 1971. Genetic implications of large early gains and heavy weights. J. Anim. Sci. 33: 197. (Abstr.) presented ASAS.

Brown, J. E., C. J. Brown and W. T. Butts. 1971. Patterns of relationship between weights and maturing rate. J. Anim. Sci. 33: 197. (Abstr.) presented ASAS.

Brown, C. J., and J. E. Brown. 1972. The influence of mature weight and rate of maturing on individual beef cow efficiency. J. Anim. Sci. 34:342. (Abstr.) presented So. Sect. ASAS.

Brown, J. E., C. J. Brown and W. T. Butts. 1972. Principal components analyses of immature Hereford and Angus bulls. Submitted for presentation ASAS.

Brown, J. E., C. J. Brown and W. T. Butts. 1972. Relationship of size and shape to efficiency and rate of growth. Submitted for presentation ASAS.

MISCELLANEOUS PUBLICATIONS AND PRESENTATIONS:

Brown, C. J. and J. E. Brown. 1971. The influence of development pattern on maintenance costs of beef cows. Rpt. of 7th Annual Ark. Anim. Sci. Res. Conf. pp. 17-20. Presented at 1971 BIF conference, Kansas City, Missouri and reprinted in Better Beef Business, Polled Hereford World, Penn. State Extension Publication and Ark. Cattle Business Magazine. Revised for Ark. Farm Res. 20:3.

Brown, J. E., C. J. Brown and R. S. Honea. 1971. Earliness of maturing and its relationship to gain and mature weight in Hereford and Angus females. Rpt. 7th Ann. Ark. Anim. Sci. Res. Conf. pp 13.

Brown, C. J., J. E. and R. S. Honea. 1972. An evaluation of pre-weaning performance of crossbred calves from four breeds of sire. Rpt. 8th Ann. Ark. Anim. Sci. Res. Conf. pp. 1-4. Reprinted in English and Spanish edition of Santa Gertrudis Journal (Apr.), Ark. Cattle Business Magazine and revised for Ark. Farm Res. 20:3.

Brown, J. E. and C. J. Brown. 1972. Relationship of size and shape to feedlot performance. Rpt. 8th Ann. Ark. Anim. Sci. Res. Conf. pp 19.

Brown, J. E. and C. J. Brown. 1972. Relationship between growth patterns of the cow and pounds of calf required to break even in weaned calf operation. Rpt. 8th Ann. Ark. Anim. Sci. Res. Conf. pp 37-40.

Lewis, P. K., Jr., K. R. Campbell, L. Younger, C. J. Brown and M. C. Heck. 1972. The effect of castration and age of animal on sensory characteristics of beef. Rpt. 8th Ann. Ark. Anim. Sci. Res. Conf. pp. 49-52.

Presentation of these research efforts have also been made before the following groups:

Arkansas Cattlemen's Association
Winrock Farms Cattle Seminar
Nebraska Cattlemen's Association
Ozark Cattlemen's Association
Arkansas Angus Association
Arkansas Charolais Association

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Arkansas

Location	Main Station	Main Station	Main Station	Main Station	
Breed of sire	Angus	Hereford	Charolais	Charolais	
Breed of dam	Angus	Hereford	Charolais	Her & Ang	
Line or group ¹	Purebred	Purebred	Purebred	Grade	
Percent used in project	100	100	100	100	
Inventory as of July 1,	Cows 2 years and over	189	120	11	33
	Yearling heifers	47	27	3	6
	Bulls and steers under 1 year	65	43	2	13
	Heifers under 1 year	88	48	4	15
	Bulls over 1 year	39	28	1	1
	Steers over 1-year	3	0	0	17
	Percent pregnant ²	79	92	100	94
Repro. perf.	Calf survival percent ³	90	92	100	92
	Adj. ADG ⁴	1.64	1.64	INC	1.71
Wean. perf.	Ave. type sc. ⁵	13	12	INC	1.71
Postweaning performance	No. of bulls	42	35	2	0
	No. of heifers	49	32	5	23
	No. of steers	3	0	0	25
Slaughtered performance	No. of bulls	14	6	1	0
	No. of heifers	0	2	1	0
	No. of steers	0	0	0	27
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments: age, sex, age of dam⁵ Suggest S-10 scoring system; indicate if different.
S-10-1 (Rev.)

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Florida

Location	RCS	RCS	RCS	RCS	RCS
Breed of sire	Angus	Brahman	Charolais	A, B & C	A, B & C
Breed of dam	Pure A	Pure B	Pure C	F, Calves	Backcross & 3-Br.-Cross
Line or group ¹	100	100	100	100	100
Percent used in project	13	17	13	71	102
Inventory as of July 1,	Cows 2 years and over	4	4	4	27
	Yearling heifers	4	5	4	22
	Bulls and steers under 1 year	6	6	5	27
	Heifers under 1 year	3	3	3	
	Bulls over 1 year				
	Steers over 1-year				
	Percent pregnant ²	54	94	62	72
Repro. perf.	Calf survival percent ³	71	87	100	91
	Adj. ADG ⁴	1.69	1.84	2.03	1.95
Wean. perf.	Ave. type sc. ⁵	12	11	12	12
Postweaning performance	No. of bulls				
	No. of heifers				
	No. of steers	1	6	5	19
	No. of bulls				
	No. of heifers				
Slaughtered performed	No. of steers	1	6	5	19
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Florida - Belle Glade

Location		Belle Glade	Bell Glade		
Breed of sire		Hereford	Hereford		
Breed of dam		Hereford	Hereford		
Line or group ¹		Brighton	Brighton		
Percent used in project		100	100		
Inventory as of July 1.	Cows 2 years and over	107	107		
	Yearling heifers	38	35		
	Bulls and steers under 1 year	35	37		
	Heifers under 1 year	34	42		
	Bulls over 1 year	23	24		
	Steers over 1-year				
Repro. perf.	Percent pregnant ²	73	82		
	Calf survival percent ³	92.0	92.0		
Wean. perf.	Adj. ADG ⁴				
	Ave. type sc. ⁵	11	12		
Postweaning performance	No. of bulls				
	No. of heifers				
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Florida - Belle Glade

Location	Belle Glade	Belle Glade	Belle Glade	Belle Glade	Belle Glade
Breed of sire	Brangus	Brahman	Limousin	Maine-Anjou	Simmental
Breed of dam	A-Bg-H	A-Bg-H	A-Bg-H	A-Bg-H	A-Bg-H
Line or group ¹	Brangus	Brahman	Limousin	Maine-Anjou	Simmental
Percent used in project	100	100	100	100	100
Inventory as of July 1.	Cows 2 years and over	60	60	60	60
	Yearling heifers				
	Bulls and steers under 1 year				
	Heifers under 1 year				
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²				
	Calf survival percent ³				
Wean. perf.	Adj. ADG ⁴				
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls				
	No. of heifers				
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks: New Project - no production data at this time.					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Florida

Location	Brooks-ville	Brooks-ville	Brooks-ville	Brooks-ville	Brooks-ville	Brooks-ville
Breed of sire	Angus	Brahman	Brahman	Hereford	Hereford	Hereford
Breed of dam	Angus	Brahman	G. Brahman	Hereford	Hereford	Hereford
Line or group ¹	Purebred	Purebred	Grade	Line 4	Line 5	Line 6
Percent used in project	100	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	187	46	81	84	18
	Yearling heifers	47	16	40	18	2
	Bulls and steers under 1 year	71	13	43	38	8
	Heifers under 1 year	73	18	38	20	2
	Bulls over 1 year	78	18	40	31	6
	Steers over 1-year	-	-	-	-	-
	Percent pregnant ²	95.0	93.0	83.0	69.0	46.0
Repro. perf.	Calf survival percent ³	93.0	70.0	99.0	92.0	86.0
	Adj. ADG ⁴	1.93	2.14	2.23	2.00	1.87
Wean. perf.	Ave. type sc. ⁵	10.0	10.0	1.0	9.0	9.0
Postweaning performance	No. of bulls	78	9	-	25	5
	No. of heifers	63	17	42	27	7
	No. of steers	-	-	-	-	-
Slaughtered performance	No. of bulls	-	-	-	-	-
	No. of heifers	-	-	-	-	-
	No. of steers	-	-	-	-	-
Remarks						

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

GEORGIA COASTAL PLAIN
EXPERIMENT STATION
Tifton, Georgia

I. PROJECT: State 2-99 (S-10)

Selection of beef cattle for single items of importance in profitable beef production.

II. OBJECTIVES:

To obtain preliminary information on the relative effectiveness of selecting for a single character.

To observe trends in characters for which no selection is made when selection is for a single character.

III. PERSONNEL:

Hollis D. Chapman, T. M. Clyburn and W. C. McCormick

IV. ACCOMPLISHMENTS DURING THE YEAR:

Four herds of grade Polled Hereford females, owned and maintained by the Georgia State Prison Farm, Reidsville, are used to study selecting for (1) weaning weight, (2) rate of postweaning gain, (3) type score, and (4) average performance. For the latter group, replacements with records nearest average for each trait are selected. Bulls used in all four groups are selected from the Polled Hereford herd at Tifton. Weaning data for the 1971 calf crop are shown in Table 1.

TABLE 1. WEANING DATA, GENERATION 2 COWS, 1971
CALF CROP

Herd	No. calves weaned	Avg, birth weight	ADG-birth to weaning	Weaning Scores	
				Type	Condition
Avg.	50	69	1.31	11.1	8.9
Rate of gain	40	76	1.46	11.3	9.2
Score	51	68	1.30	10.9	9.0
Wean. wt.	43	74	1.42	11.3	9.2

V. FUTURE PLANS:

The project will be continued as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None.

VII. PUBLICATIONS PLANNED:

A manuscript, "Criteria for selection of introduced beef sires", will be published in the August, 1972 issue of J. Anim. Sci.

I. PROJECT: Animal Husbandry 209, AHRD d1-3 (S-10)

A study of grading, crisscrossing and rotational crossing as breeding systems for commercial beef production.

II. OBJECTIVES:

To study the relative value of grading, crisscrossing and rotational crossing as breeding systems for commercial beef production.

To study heterotic effects in crosses between Angus and Polled Hereford breeds, as compared to heterosis in crosses between these breeds and Santa Gertrudis -- a breed based partially on a Brahman foundation.

To study the comparative value of the Santa Gertrudis breed with the Angus and Polled Hereford breeds.

III. PERSONNEL:

Hollis D. Chapman, T. M. Clyburn and W. C. McCormick.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Weaning data for the 1971 calf crop by generation 2 animals are as shown in the following table.

TABLE 1. WEANING DATA, 1971 CALVES, GENERATION 2 COWS

Herd	Breeding system	No. calves born	Avg. birth wt.	ADG birth to weaning	Avg. type score	Avg. condition score
Gr. A	Grading-up	37	64	1.32	11.3	9.5
Gr. PH	Grading-up	41	71	1.56	11.3	9.5
Gr. SG	Grading-up	22	76	1.80	11.1	10.0
AxPH	Crisscross	40	67	1.53	11.6	10.0
AxSG	Crisscross	36	76	1.73	11.6	10.0
PHxSG	Crisscross	30	80	1.92	11.8	10.3
AxPHxSG	Rotational crossing	55	71	1.75	11.8	10.2

V. FUTURE PLANS:

The studies will be continued as planned.

VI. PUBLICATIONS DURING THE YEAR:

Chapman, Hollis D., T. M. Clyburn and W. C. McCormick. Grading two- and three-breed rotational crossing as systems for production of slaughter steers. J. Anim. Sci. 32:1062.

VII. PUBLICATIONS PLANNED:

None.

I. PROJECT: Hatch 224

Crossing Simmental and Polled Hereford with the ultimate objective of producing "purebred" Simmental.

II. OBJECTIVES:

To produce part-Simmental bulls to use in crossbreeding and grading up studies.

To multiply the number of Simmental and part-Simmental cattle so that comparisons with other cattle (primarily Polled Hereford in this case) can be made.

To characterize cattle of part-Simmental breeding with respect to traits of production which are important.

III. PERSONNEL:

Hollis D. Chapman and W. C. McCormick.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Table 1 shows data collected to date on two calf crops by breed and sex. Only five 3/4 Simmental calves (a 50% calf crop) have been produced thus far so these data are not reported. The records shown are for 1/2 Simmental calves representing three sires.

V. FUTURE PLANS:

The project will be continued as outlined.

VI. PUBLICATIONS:

None.

TABLE 1. MEANS AND STANDARD ERRORS OF GROWTH TRAITS OF SIMMENTAL X POLLED HEREFORD (SxPH) AND CONTEMPORARY POLLED HEREFORD (PH) CALVES

Year	Sex	No.	Breed	Birth wt., lb. ^a	Adj. wean. wt., lb.	Postwean. ADG, lb.	Yearling score	Age, days	WPDA 1b.
70-71	Bull	8	SxPH	86 + 2.7	454 + 8.5	3.56 + .06	13 + .15	396 + 5.8	2.77 + .04
70-71	Bull	32	PH	70 + 1.5	379 + 8.6	2.93 + .06	12 + .12	388 + 4.0	2.29 + .04
70-71	Heifer	10	SxPH	81 + 2.1	450 + 16.9	1.22 + .07	12 + .23	399 + 2.9	1.68 + .06
70-71	Heifer	14	PH	67 + 2.4	437 + 7.6	1.13 + .04	12 + .08	396 + 2.9	1.59 + .03
71-72	Bull	13	SxPH	85 + 4.2	458 + 16.6	3.10 + .08	12 + .19	384 + 4.1	2.64 + .07
71-72	Bull	28	PH	73 + 1.6	409 + 10.4	2.83 + .08	12 + .19	379 + 4.1	2.35 + .05
71-72	Heifer	17	SxPH	76 + 3.1	464 + 13.1	1.20 + .05	12 + .18	388 + 2.6	1.69 + .04
71-72	Heifer	14	PH	72 + 1.7	458 + 11.8	1.09 + .05	12 + .20	386 + 4.2	1.60 + .04

^a Average length of gestation of SxPH calves was 286 + 2 and 283 + 2 for bulls and heifers, respectively, in 1971 and 1972.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Georgia

Location	Reidsville	Reidsville	Reidsville	Reidsville
Breed of sire	PH	PH	PH	PH
Breed of dam	PH	PH	PH	PH
Line or group ¹	Rate of gain	In Wean wt.	Type	Average
Percent used in project	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	48	58	58
	Yearling heifers	15	17	26
	Bulls and steers under 1 year	24	29	27
	Heifers under 1 year	16	18	27
	Bulls over 1 year	2	2	2
	Steers over 1-year	12	12	12
	Percent pregnant ²	83.3	81.0	93.1
Repro. perf.	Calf survival percent ³	100.0	91.4	87.9
	Adj. ADG ⁴	1.46	1.42	1.30
Wean. perf.	Ave. type sc. ⁵	11.3	11.3	10.9
Postweaning performance	No. of bulls	0	0	0
	No. of heifers	15	17	26
	No. of steers	12	12	12
Slaughtered performance	No. of bulls	0	0	0
	No. of heifers	0	0	0
	No. of steers	12	12	12
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: none (age at weaning - 226 days).

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Georgia

Location	Reidsville	Reidsville	Reidsville	Reidsville	Reidsville
Breed of sire	A	PH	SG	A, PH	A, SG
Breed of dam	A	PH	SG	AxPH	AxSG
Line or group ¹	Grade	Grade	Grade	Crisscross	Crisscross
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	39	43	37	48
	Yearling heifers	23	16	13	27
	Bulls and steers under 1 year	15	26	11	13
	Heifers under 1 year	22	15	11	27
	Bulls over 1 year	4	4	4	4
	Steers over 1-year	8	8	8	8
Repro. perf.	Percent pregnant ²	94.9	95.3	62.2	83.3
	Calf survival percent ³	100.0	100.0	91.3	95.0
Wean. perf.	Adj. ADG ⁴	1.32	1.56	1.80	1.62
	Ave. type sc. ⁵	11.3	11.3	11.1	11.6
Postweaning performance	No. of bulls	0	0	0	0
	No. of heifers	23	16	13	27
	No. of steers	8	8	8	8
	No. of bulls	0	0	0	0
Slaughtered performance	No. of heifers	0	0	0	0
	No. of steers	8	8	8	8
	Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: None

⁵ Suggest S-10 scoring system; indicate if different.

State Georgia

Location	Reidsville	Reidsville	Tifton	Tifton
Breed of sire	PH, SG	A, PH, SG	PH	A
Breed of dam	PHxSG	A, PH, SG	PH	A
Line or group ¹	Crisscross	3-breed X	Purebred	Purebred
Percent used in project	100	100	80	80
Inventory as of July 1,	Cows 2 years and over	40	64	98
	Yearling heifers	14	24	14
	Bulls and steers under 1 year	16	29	39
	Heifers under 1 year	14	26	47
	Bulls over 1 year	4	4	7
	Steers over 1-year	8	12	0
Repro. perf.	Percent pregnant ²	75.0	84.4	87.8
	Calf survival percent ³	93.3	94.4	96.5
Wean. perf.	Adj. ADG ⁴	1.92*	1.75*	1.67**
	Ave. type sc. ⁵	11.8	11.8	11.6
Postweaning performance	No. of bulls	0	0	39
	No. of heifers	14	24	47
	No. of steers	8	12	0
Slaughtered performed	No. of bulls	0	0	11
	No. of heifers	0	0	20
	No. of steers	8	12	0
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: *none; **sex, age, age of dam

⁵ Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF KENTUCKY
Agricultural Experiment Station
Lexington, Kentucky

I. PROJECT: Animal Science 260 (S-10) (Revised)

Selection for increased growth rate in beef cattle.

II. OBJECTIVES:

To use growth rate as a single criteria for selection when measured at a year of age.

To investigate phenotypic and genetic relationships between various preweaning and postweaning performance traits, preweaning and postweaning conformation scores and carcass traits.

To compare heritabilities of and the phenotypic and genetic correlations among various preweaning and postweaning performance traits, preweaning and postweaning conformation scores, and carcass traits when the estimates are obtained from two populations where the criteria of selection is different for each population.

III. PERSONNEL:

F. A. Thrift, J. D. Kemp, J. R. Overfield and H. D. Hupp

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Selection of bulls and heifers.

The project was revised in 1969 and 233 purebred Hereford cows, represented by 40 sires, were randomly allotted into two groups (Control, Select) on the basis of sire and age. A total of 17 different sires was used as foundation sires during the 3-year period, 1969-1971, and are being replaced by their selected sons according to the project outline. The first group of 12 selected bulls (born in 1970) is currently being exposed to 230 females (64 2-year-old heifers and 166 cows 3 years and older).

The second group of bulls available for selection (born in 1971) were weighed off their 160-day postweaning feeding test in March of 1972. Of the 73 bulls available for selection, 6 were selected for the select line and 6 for the control line on a within-sire basis. Each of the 12 bulls is backed up by a spare bull. The 365-day

weights for the 12 selected bulls are presented in Table 1. The 6 bulls selected for the select line average 99 pounds heavier at 365 days than the 6 bulls in the control line. These 12 bulls will be used for only one breeding season (2 years of age) and each of the 6 bulls in the select line will be replaced by his heaviest son at 365 days of age; whereas, each of the 6 bulls in the control line will be replaced by a randomly selected son.

At the end of the 160-day postweaning test, 74 heifers (born in 1971) were available for selection. Due to poor reproduction of the cow herd, all 74 heifers were retained as replacements for the herd. These heifers are being managed to calve first at 3 years of age.

2. Collection of carcass data.

After the 24 bulls were selected, the remaining 49 bulls were slaughtered and routine carcass data obtained.

3. Collection of "pinkeye" data.

During the preweaning growth period of 1970 and 1971, considerable problem was encountered with "pinkeye" among several of the Hereford calves during the summer months. Closer examination of the herd revealed that not all calves were having the "pinkeye" problem. Thus, it was decided that all of the 1971 calves would be subjectively scored for "pinkeye" during July of 1971 when incidence of the eye disorder appeared to be greatest. This information is summarized by sire in Table 2. The weaning weights presented are actual rather than adjusted and the data on both sexes are combined. It was originally thought that the calves born late in the calving season may be more susceptible to the "pinkeye" condition. Although the calves with the "pinkeye" had an average birthdate 5 days later than those without "pinkeye", it is doubtful that a difference of 5 days could account for the 47 pounds difference in weaning weight. There appears to be considerable variability among sire groups with respect to the "pinkeye" condition; however, the values presented in the last column of Table 2 are somewhat misleading because of the differing number of offspring by each sire.

Additional data on the bulls are summarized in Table 3. Six bulls died during the 160-day postweaning test period from a "respiratory complex", but only one of the 6 was a bull that had the "pinkeye" condition prior to weaning. The calves born in 1972 will be evaluated for "pinkeye" also since they are progeny of several of the 1971 sires.

4. Breeding, calving and culling of cows.

During a 65-day breeding season (May 10 to July 15) in 1971, 210 females were exposed to 12 of the foundation sires, with females from the two lines being bred to each of the foundation sires. No heifers were exposed during the 1971 breeding season, since this was the first year that the heifers were switched from breeding at 1 year of age to 2 years of age. Of the 210 females exposed, 200 were present in the herd when the calves were weaned in early October. Forty-one of these 200 females (19 calves and 22 first calf heifers) were diagnosed as being open at the time the calves were weaned. All 19 cows and 3 of the first calf heifers were culled from the herd. This poor rebreeding performance of the first calf 2-year-old heifers is the primary reason for switching the heifers to calve first at 3 years of age.

On January 17, 1972, there were 178 cows in the herd available to calve (19 of these were the 2-year-old heifers known to be open). Seven of the cows in addition to the 19 heifers did not calve and these 7 cows were culled. Of the 152 calves born, 17 (12%) were either dead at birth or died within a short period after birth as a result of birth complications and/or severe weather.

V. FUTURE PLANS:

Future plans are to continue according to the revised project outline.

VI. PUBLICATIONS DURING THE YEAR:

Boling, J. A., F. A. Thrift and D. L. Cross. 1971. Plasma amino acid patterns and nitrogen constituents in yearling bulls and heifers with different rates of growth. Kentucky Animal Sci. Res. Rpt. Prog. Rpt. 196.

Thrift, F. A. 1971. Beef cattle breeding research at the West Kentucky Substation. Proc. 1971 Anim. Agric. Days.

Thrift, F. A. and C. W. Absher. 1971. Freeze vs. fire branding as methods of beef cattle identification. Proc. 1971 Anim. Agric. Days.

VII. PUBLICATIONS PLANNED:

None.

TABLE 1. 365-DAY WEIGHTS FOR SECOND GROUP OF SELECTED BULLS (BORN IN 1971) BY LINE AND FOUNDATION SIRE

Foundation sire	Line ^a		s-c
	Select (s)	Control (c)	
A ₂	A _{s2} = 786	A _{c2} = 647	139
B ₂	B _{s2} = 749	B _{c2} = 683	66
C ₁	C _{s2} = 717	C _{c2} = 660	57
D ₂	D _{s2} = 733	D _{c2} = 634	99
E ₁	E _{s2} = 816	E _{c2} = 677	139
F ₂	F _{s2} = 718	F _{c2} = 626	92
Ave. ^b	753	654	99

^aA_{s2} represents heaviest bull at 365 days sired by foundation sire A₂, and A_{c2} represents randomly selected bull sired by A₂, etc.

^bAverage 365-day weight for all 73 bulls available for selection was 626 pounds.

TABLE 2. 1971 S-10 PINKEYE DATA

Sire	No.	Absent (A) ^b			Pinkeye classification ^a			A-P	% Incidence
		No.	Birthdate	Wean.	Wt.	No.	Birthdate	Wean.	
576	8	Feb.	24	362	5	Feb.	28	314	48
702	6	Mar.	1	298	3	Feb.	25	262	36
703	12	Mar.	2	317	8	Mar.	16	285	3/9 (33%)
725	10	Feb.	28	355	1	Mar.	11	254	32
776	15	Mar.	1	348	2	Feb.	25	319	101
832	7	Mar.	2	314	1	Mar.	8	188	1/11 (9%)
788	5	Mar.	5	300	8	Mar.	8	289	29
816	11	Mar.	2	333	3	Mar.	10	266	2/17 (12%)
846	5	Feb.	26	352	7	Mar.	5	299	126
904	14	Mar.	2	331	5	Mar.	2	265	1/8 (13%)
932	12	Feb.	26	328	0				11
955	7	Mar.	6	304	3	Mar.	3	276	8/13 (62%)
Ave.	112	Mar.	1	331	46	Mar.	6	284	67
									3/14 (21%)
									53
									7/12 (58%)
									66
									5/19 (26%)
									0/12 (0%)
									3/10 (30%)
									47
									46/158 (29%)

^a Calves evaluated on 7-27-71.^b No pinkeye in either eye.^c Pinkeye in either right or left eyes or both.

TABLE 3. 1971 S-10 PINKEYE DATA (BULLS)

Pinkeye classification ^a	No.	Actual Weaning		Actual Yearling	
		Age	Weight	Age	Weight
Absent ^b	46	218	335	384	664
Present ^c	27	211	282	377	589
Difference	73	7	53	7	75

^a Calves evaluated on 7-27-71.^b No pinkeye in either eye.^c Pinkeye in either right or left eyes or both.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Kentucky

Location	Princeton	Princeton	Princeton	
Breed of sire	Hereford	Hereford	Hereford	
Breed of dam	Hereford	Hereford	Hereford	
Line or group ¹	Control	Select	Foundation Sires	
Percent used in project	100	100		
Inventory as of July 1, 1971.				
Cows 2 years and over	84	82		
Yearling heifers	34	30		
Bulls and steers under 1 year	35	39		
Heifers under 1 year	30	30		
Bulls over 1 year	24	24	2	
Steers over 1-year				
Repro. perf.				
Percent pregnant ²	75	77		
Calf survival percent ³	87	89		
Wean. perf.				
Adj. ADG ⁴	1.55	1.53		
Ave. type sc. ⁵	11.5	11.5		
Postweaning performance				
No. of bulls	36	37		
No. of heifers	41	33		
No. of steers				
Slaughtered performance				
No. of bulls	24	25		
No. of heifers				
No. of steers				
Remarks				

¹ * - 2-year-old heifers.

Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

Percent of calves born (dead and alive) that survived to weaning.

The product of percent pregnant and survival percent gives weaning percent.

³ Indicate adjustments: Age of dam; Sex of calf.⁴ Suggest S-10 scoring system; indicate if different.

LOUISIANA STATE UNIVERSITY
Agricultural Experiment Station
Baton Rouge, Louisiana

I. PROJECT: Hatch 605 (Revised)

General Title: Breeding methods for beef cattle in the Southern Region.

Specific Title: Evaluation of systematic rotational crossbreeding plans for producing beef cattle in the Gulf Coast region.

II. OBJECTIVES:

To evaluate systematic breeding procedures.

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

J. W. Turner, George L. Robertson, T. D. Bidner, P. E. Humes,
S. E. McCraine, Ted O. McRae and Dorothy C. Wilson.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

The primary objective of evaluating rotational crossbreeding is based upon performance and comparisons among 11 lines of breeding. Straightbred Angus, Brahman, Charolais and Hereford herds were assigned as Lines 1, 2, 3, and 4 respectively. Lines 5, 6 and 7 were assigned to crisscross programs involving the Brahman breed in combination with the Angus, Charolais and Hereford breeds, respectively. Three-breed rotational lines involving the Brahman as a common breed were assigned to Lines 8, 9 and 10. Line 8 was composed of Angus, Brahman and Hereford combinations. Line 10 was assigned to the combination of Hereford, Charolais and Brahman. The last line, Line 11, was the four-breed combination. All rotational crossing lines were established with hybrid cows of Angus-Brahman or Hereford-Brahman breeding. Reciprocal crosses were represented in each line. However, Line 6 was based on Charolais x Brahman females. The project is divided into phases that correspond to generations. Phase I involved production of

backcross progeny in the crisscross lines and three-breed cross progeny in the remaining rotational lines. Phase II will evaluate the maternal and producing abilities of progeny produced under Phase I. Similar consideration is planned through Phase IV or four generations for all lines. Four years are planned for each phase. Data collection of reproductive, preweaning, postweaning and carcass traits are standard for each phase.

Comparisons among lines within each phase and evaluation of line performance over generations are planned to determine the effectiveness of rotational crossbreeding schemes.

2. Research results.

The 1971 calf crop was the second produced under Phase I. Summary statistics relative to performance in several production traits are shown in the attached tables.

Dr. Richard P. McDonald completed the requirements for the Ph.D. utilizing data generated from the project in earlier years. His research problem involved estimating maternal heterosis in pre-weaning traits by comparing three-breed cross progeny with the average of singlecrosses produced from straightbred cows of the crossbred cow parental breeds. Also, estimates of heterosis in crossbred calves were made such that complete production of three-breed cross calf means were attainable. Results indicated the relative contribution of additive, specific heterosis and maternal heterotic effects were 84.8%, 8.6% and 6.6%, respectively. Actual estimates of maternal heterosis for weaning weight are contained in the attached tables. Prediction of mean performance for weaning weight were made for several crisscross and three-breed rotational schemes.

Cooperative studies of estrous control with sperm numbers and time of insemination treatments were completed with reproductive physiology personnel.

V. FUTURE PLANS:

Execution and data collection will continue as planned. However, feedlot steers will be placed directly on feed at weaning rather than grazed for 140 days. This management change scheduled for 1972 steers was outlined as an alternative in the project outline.

VI. PUBLICATIONS DURING THE YEAR:

Burns, E. C., W. G. Harris, J. W. Turner, J. M. Perkins and T. O. McRae. 1971. Horn fly control using insecticides in dust bags. The Louisiana Cattleman. April LXXI:4:10.

Luckett, R. L., T. D. Bidner and J. W. Turner. 1972. The tenderometer as a measure of beef tenderness. J. Anim. Sci. 34:347. (Abstr.).

McDonald, R. P. and J. W. Turner. 1971. Cows, calves and crossbreeding. The Louisiana Cattleman. May LXXI:5:4.

McDonald, R. P. 1972. Estimation of maternal heterosis in preweaning traits and predictions of rotational crossbreeding performance in beef cattle. Ph.D. Dissertation. Louisiana State University, Baton Rouge, Louisiana.

McDonald, R. P. and J. W. Turner. 1972. Maternal heterosis in weaning traits of cattle. J. Anim. Sci. 34:343. (Abstr.).

Turner, J. W. 1971. Design your own crossbreds. The Progressive Farmer. November 86:11:52.

Turner, J. W. 1971. "Genetic Engineering" to improve southern beef cattle. Proceedings 1970 Southern Beef Conference, Jackson, Mississippi, p. 53.

Turner, J. W. 1971. Reciprocal-cross beef cows compared. The Louisiana Cattleman. December LXXI:12:8.

VII. PUBLICATIONS PLANNED:

McDonald, R. P. and J. W. Turner. 1972. Estimation of maternal heterosis in preweaning traits of beef cattle.

TABLE 1. 1971 REPRODUCTIVE AND PREWEANING SUMMARY STATISTICS

Line of breeding ^a	Calves born	Calves weaned	Birth weight	Weaning age	Weaning weight ^b	Slaughter score	Type score	Cow weight	Weaning ratio ^c
(1) A	88.6	85.7	61.1	1b days	419	9.8	10.6	951	0.44
(2) B	71.4	71.4	58.1	204	394	9.4	10.0	960	0.41
(3) C	77.1	74.3	79.3	233	538	9.7	11.6	1205	0.45
(4) H	80.0	70.0	66.8	226	411	9.8	10.4	1037	0.40
(5) A ³ B ¹	88.9	85.2	57.1	231	473	10.5	11.0	1006	0.47
(6) C ³ B ¹	93.3	80.0	72.0	229	555	9.9	11.3	1180	0.47
(7) H ³ B ¹	93.3	90.0	66.4	231	505	10.6	11.3	1102	0.46
(8) C ² A ¹ B ¹	85.2	77.8	68.8	230	537	9.7	11.2	1030	0.52
(9) A ² H ¹ B ¹	93.5	93.5	61.3	235	508	10.9	11.5	1060	0.48
(10) C ² H ¹ B ¹	86.7	83.3	73.1	234	576	10.3	11.9	1148	0.50
(11) H ² A ¹ B ¹	88.5	80.8	69.2	230	527	10.6	11.7	1068	0.49
Average	85.7	81.0	66.6	229	494	10.1	11.1	1067	0.46

^aBreeds are coded: A = Angus, B = Brahman, C = Charolais, H = Hereford. Crossbred breedings refer to proportion of blood in crisscross and three- and four-breed rotation lines, i.e., A³B¹ means 3/4 Angus and 1/4 Brahman progeny.

^bUnadjusted.

^cRatio of unadjusted weaning weight to weaning cow weight.

TABLE 2. 1970 HEIFER PUBERTY DATA

Line of breeding ^a	Number of heifers	Puberty age ^b	Estimated yearling weight ^c	Long yearling weight	Long yearling age
		days	lb	lb	days
(1) A	14	352	459	634	507
(2) B	9	-	434	605	480
(3) C	8	384	518	729	501
(4) H	5	415	450	642	509
(5) A ³ B ¹	14	370	491	674	506
(6) C ³ B ¹	11	337	532	735	493
(7) H ³ B ¹	15	392	487	680	503
(8) C ² A ¹ B ¹	9	384	557	771	513
(9) A ² H ¹ B ¹	15	343	523	722	511
(10) C ² H ¹ B ¹	14	364	559	765	499
(11) H ² A ¹ B ¹	7	397	527	733	510

^a See footnote Table 1.^b Puberty age is not shown for Brahman heifers. Only two heifers cycled before Fall (October 1971). The average age of the heifers on October 1, 1971 was 573 days of age or approximately 18 months.^c Estimated by adjusting January weights and ages for group average daily gain to April live weights.

TABLE 3. 1970 STEER PERFORMANCE DATA

Line of breeding ^a	Number of steers	ADG on feed	Carcass weight	Carcass grade ^b	Yield grade	Fat thickness
		lb	lb			in
(1) A	11	2.75	450	10.5	2.7	0.36
(2) B	5	2.32	471	8.2	2.8	0.21
(3) C	12	3.44	572	8.9	1.6	0.14
(4) H	9	2.80	442	9.2	2.6	0.35
(5) A ³ B ¹	10	2.46	475	9.0	2.6	0.31
(6) C ³ B ¹	12	2.86	558	8.5	1.7	0.14
(7) H ³ B ¹	12	2.70	502	8.7	2.3	0.24
(8) C ² A ¹ B ¹	9	2.83	543	9.1	2.1	0.20
(9) A ² H ¹ B ¹	15	2.68	532	9.7	2.6	0.32
(10) C ² H ¹ B ¹	12	2.75	569	8.8	2.1	0.20
(11) H ² A ¹ B ¹	17	2.62	514	9.0	2.5	0.26
Average	124	2.75	517	9.1	2.3	0.25

^a See footnote Table 1.^b A score of 10 denotes a grade of average good with each unit of change referring to one-third of a grade.

TABLE 4. MATERNAL HETEROZIS FOR WEANING WEIGHT^a

Breed of dam	Angus (A)		Brahman (B)		Breed of sire		Composite	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
AxB			17.1**	6.5	15.8*	8.4	14.1*	6.3
BxA			19.8**	6.8	8.7	6.8	33.0**	7.5
AxB + BxA			18.4**	5.3	12.2*	5.9	23.5**	5.3
AxBa	3.4	6.8			16.7*	7.7	-1.8	6.6
BaxA	-9	8.5			-2.8	8.5	0.3	7.4
AxBa + BaxA	1.3	5.9			6.9	6.3	-.8	5.4
AxH	10.7	7.2	5.2		2.1	7.7		
HxH	7.9	8.1	12.5*	6.7	10.2	10.9	6.0	4.3
AxH + HxH	9.3	6.0	8.8*	5.4	.6.2	7.1	10.3*	5.0
							8.1*	3.6
BxBa	15.6**	5.4			13.2*	5.9	11.9*	5.9
BaxB	5.8	7.9			23.4*	10.9	12.0	7.8
BxBa + BaxB	10.7*	5.3			18.3**	6.7	12.0*	5.4
BxH	25.9*	6.0			31.4**	6.4	17.2*	7.4
HxB	45.6**	5.5			26.8**	6.8	25.8**	6.5
BxH + HxB	35.7**	4.6			29.1**	5.2	21.5**	5.5
							24.8**	3.9
BaxH	6.2	7.2	3.2				32.7**	3.6
HxBa	14.1*	6.9	10.7	6.6			28.8**	3.0
BaxH + HxBa	10.2*	5.4	6.9	5.7				
							7.2	4.4
							12.7**	4.0
							9.9**	3.3

^aEstimates are expressed in kilograms.

*P .05.

**P .01.

State Louisiana

Location	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of sire	Angus	Angus	Charolais	Hereford	Brahman
Breed of dam	Angus	A x B	A x B	A x B	Brahman
Line or group ¹	1	5	8	11	2
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	28	9	9	11
	Yearling heifers	9	4	4	2
	Bulls and steers under 1 year	11	8	6	4
	Heifers under 1 year	15	2	4	3
	Bulls over 1 year	4	-	-	-
	Steers over 1-year	4	-	-	-
	Percent pregnant ²	88.6	100.0	91.7	80.0
Repro. perf.	Calf survival percent ³	96.8	100.0	90.8	87.5
	Adj. ADG ⁴	1.53	1.76	1.93	1.92
Wean. perf.	Ave. type sc. ⁵	10.6	10.7	11.2	11.4
Postweaning performance	No. of bulls				
	No. of heifers				
	No. of steers	11	4	4	6
	No. of bulls				
Slaughtered performance	No. of heifers				
	No. of steers	11	4	4	6
	No. of steers				5
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: None

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Louisiana

Location	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of sire	Angus	Charolais	Hereford	Angus	Charolais
Breed of dam	B x A	B x A	B x A	B x H	B x H
Line or group ¹	5	8	11	9	10
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	12	12	13	14
	Yearling heifers	7	2	6	7
	Bulls and steers under 1 year	3	3	9	8
	Heifers under 1 year	9	9	4	4
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²	81.3	80.0	93.8	93.8
	Calf survival percent ³	92.2	91.6	93.3	100.0
Wean. perf.	Adj. ADG ⁴	1.83	2.15	2.02	1.96
	Ave. type sc. ⁵	11.3	11.2	11.8	11.5
Postweaning performance	No. of bulls				
	No. of heifers				
	No. of steers	6	6	11	8
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers	6	5	11	8
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning.

The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: None

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Louisiana

Location	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of sire	Hereford	Charolais	Charolais	Hereford	Angus	
Breed of dam	B x H	Charolais	C x B	Hereford	H x B	
Line or group ¹	7	3	6	4	9	
Percent used in project	100	100	100	100	100	
Inventory as of July 1,	Cows 2 years and over	12	26	24	21	14
	Yearling heifers	8	17	12	13	7
	Bulls and steers under 1 year	8	12	9	9	8
	Heifers under 1 year	4	12	15	10	6
	Bulls over 1 year	-	5	-	4	-
	Steers over 1-year					
Repro. perf.	Percent pregnant ²	93.8	77.1	93.3	80.0	93.3
	Calf survival percent ³	93.3	96.4	85.7	87.5	100.0
Wean. perf.	Adj. ADG ⁴	1.91	1.97	2.09	1.51	1.86
	Ave. type sc. ⁵	11.4	11.6	11.3	10.4	11.5
Postweaning performance	No. of bulls					
	No. of heifers					
	No. of steers	7	12	12	9	7
Slaughtered performance	No. of bulls					
	No. of heifers					
	No. of steers	7	12	12	9	7
Remarks						

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments: None⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Louisiana

Location	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of sire	Charolais	Hereford	Angus	Red Polled	Straightbred
Breed of dam	H x B	H x B	Misc. X'x	& X-bred's*	
Line or group ¹	10	7			Totals
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	11	11	-	384
	Yearling heifers	5	6	-	126
	Bulls and steers under 1 year	2	6	1	118
	Heifers under 1 year	9	4	1	125
	Bulls over 1 year	-	-	-	21
	Steers over 1-year	-	-	-	4
	Percent pregnant ²	93.3	92.9	-	85.7
Repro. perf.	Calf survival percent ³	92.9	100.0	-	94.5
	Adj. ADG ⁴	2.08	1.89	-	1.86
	Ave. type sc. ⁵	11.7	11.2	-	11.1
Postweaning performance	No. of bulls				
	No. of heifers				
	No. of steers	5	5	-	125
	No. of bulls				
Slaughtered performance	No. of heifers				
	No. of steers	5	5	-	124
	Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning.

The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: None

⁵ Suggest S-10 scoring system; indicate if different.

IBERIA LIVESTOCK EXPERIMENT STATION
Jeanerette, Louisiana

I. PROJECT: 03 30 002 19 06 (Revision No. 2)

Selection for changes in fat in beef cattle and the response of selection for adaptability of beef cattle in the Gulf Coast area.

II. OBJECTIVES:

To determine if changes in fat thickness of Angus and Brangus cattle can be made by selection in opposite directions for fatness -- high fat and low fat.

To estimate genetic and environmental relationships of fatness and leaness with other performance and carcass traits.

To determine whether changes in adaptation and performance of Angus cattle can be made by selection of the best available sires from within the herd or by selection of the best available bulls from outside the area.

To develop techniques which will better estimate the overall merit of beef cattle.

III. PERSONNEL:

T. M. DeRouen, D. C. Meyerhoeffer, W. L. Reynolds, R. A. Harpel,
N. T. Poche' and Betty P. Buteau, Jeanerette, Louisiana.
T. D. Bidner and J. W. Turner, Baton Rouge, Louisiana.
Will T. Butts, Jr., Knoxville, Tennessee.
Paul A. Putnam, Beltsville, Maryland.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

Emphasis on the selection of beef cattle with less external fat and a higher percent of lean or muscle is given considerable attention in modern-day breeding. Estimates of heritability of lean and fat traits in cattle have indicated that progress in these characteristics can be made by selection. This investigation was initiated to study the practicability of such selection methods with beef cattle and to determine if there are relationships among traits

that would cause complications in selecting for or against external fat. Information is needed regarding selection progress for or against fatness, as well as the response of other traits to this type of selection. Angus and Brangus cattle are involved in this selection study.

Low production and poor adaptation of British beef breeds to the environment of the Gulf Coast area have been a major problem with these cattle. English breeds of beef cattle grow slowly from birth to weaning and do not attain satisfactory size at maturity. Adaptability studied in the Gulf Coast region have been primarily concerned with crossing Zebu and British beef breeds of the Zebu cattle and the productivity of the British breeds. The Iberia Station has studied the production of strains of beef cattle (Brangus and Africander-Angus) based on crossbred foundations which should be better adapted to the Gulf Coast area. Consequently, it is important to know how much improvement in performance and adaptability can be made in a British beef breed by selection.

Research is needed to determine whether selection of bulls within a closed herd or area permits as much progress as selection of bulls from outside the area. Breeders of beef cattle are confronted with and have to decide whether to obtain bulls within the area which may be better adapted or to select bulls of higher apparent quality from outside the area, including the artificial insemination studs. A comparison of these two methods of improving production of a herd could be of great economic and scientific importance. The purebred Angus herd on the station is involved in this adaptability investigation.

2. Research results.

A. Breeding season and conception.

Breeding began on April 15 and ended on July 1 (75 days). All cows were bred naturally in single sire herds on pasture with the exception of two herds of Angus cows in the adaptability study which were bred artificially. All females exposed during the breeding season were palpated for pregnancy during October. A summary of the pregnancy rate is presented in Table 1.

Sixteen (16) yearling replacement heifers weighing 600 pounds and over were put in the breeding herd in 1971. There were eight Angus heifers from the fat study, one Angus heifer from the adaptability investigation, and seven Brangus heifers from the fat experiment. The information is summarized in Table 2.

The data suggest a breed difference between Angus and Brangus heifers for reproduction. This has been consistent for the past two years. High fat heifers in each breed were lighter in weight than contemporaries in the low fat line.

B. Calving.

Calving losses were slightly higher than usual in 1971. Overall mortality was seven percent. The summary for calving is presented in Table 3.

C. Cow production.

Brangus, fat study. Birth weight was slightly heavier for the low fat calves but the difference was not significant. Two percent more of the low fat calves were raised to weaning. Weaning weight was slightly greater for the low fat line. Fat measurement of the calves at weaning was identical. Calves were not creeped. See Table 4 for results.

Angus, fat study. Weaning performance of calves -- i.e., weaning weight, fat thickness, conformation, and condition scores -- was very similar. Low fat calves appear more viable since five percent more calves were weaned. This trait has been consistent since initiation of the study. Birth weight was slightly greater for the high fat calves in 1971. Low fat calves had heavier birth weights in past years. Table 4 summarizes the results.

Angus-adaptability study. All traits measured under cow production were similar with the exception of weaning weight. Calves in the closed line were heavier at weaning, scored higher on type grade, and had a higher condition score than outside calves. Closed line calves have been consistently heavier at weaning. The data are summarized in Table 4.

D. Postweaning performance of bulls.

These bulls were fed in groups in dry lot during the fall of 1970 and winter and spring of 1971. Each bull in the fat study was fed to a weight of 800 pounds. Fat thickness, at this weight, was estimated over the 12th and 13th ribs with an ultrasonic instrument. Samples of bull progeny from each sire were slaughtered. Carcass fat measurements and other carcass traits were evaluated. See Table 5.

Brangus bulls, fat study. Low fat bulls grew faster and were fatter than bull progeny in the high fat line. The difference in fat thickness and the visual condition score were only slightly in favor of the low fat line in 1971. Five bulls in the high fat line did not weight 800 pounds at 400 days of age, whereas, only two bulls in the low fat line failed to reach 800 pounds in 400 days. Measurements of these bulls were included in Table 5. The greater fatness of the low fat bulls represent estimates on the live animal with an ultrasonic instrument (Sonoray Model 12). This may possibly be due to error in reading fat thickness in 1971. See Table 5 for results.

Angus bulls, fat study. All traits measured were very similar between the two lines. Fat estimates with the ultrasonic instrument and the visual condition score were slightly greater for the high fat line. Five bulls in the high fat line did not reach 800 pounds at 400 days of age and four bulls from the low fat line failed to weight 800 pounds at 400 days of age. Data from these animals were included in Table 5.

Angus bulls, adaptability study. Each bulls was fed to a constant age of 365 days. Growth rate and conformation were evaluated and an index was computed for each bull giving equal emphasis to these two traits.

Postweaning traits were similar between lines except for average daily gain. Since cows sired by bulls from outside the Gulf Coast area have come into production, the postweaning daily growth of the open line bulls had exceeded that of the closed line bull calves on feed test. Table 5 summarizes the performance of the bulls.

E. Slaughter data of bulls for 1971.

Daily growth rate was lower than usual in 1970-71. There were a few cases of respiratory infections during the feeding period.

All of the bull calves were not slaughtered and, therefore, the carcass data may be misleading, especially in Angus bulls in the fat study. Three bulls from each line within each breed were retained for replacements and a few bulls went into the annual bull sale held at the station.

Brangus bulls, fat study. Low fat Brangus bulls grew faster, were heavier at slaughter, and had a higher type and visual condition score than contemporaries in the high fat line. The yield grade, marbling score, and percent kidney fat showed that the low fat bulls were carrying more fat. However, the measure of fat on the carcass indicated that the low fat bulls had slightly less fat thickness over the 12th and 13th ribs. Low fat carcasses also had a higher, more desirable quality score. Results are summarized in Table 6.

Angus bulls, fat study. Bull carcasses in the low fat line had greater fat thickness over the ribs than carcasses of the high fat bulls in 1971. Marbling score and percent kidney fat were slightly greater in the low fat carcasses. Daily growth was similar between lines and was lower than in previous years for both lines. Table 6 summarizes the slaughter and carcass data.

Angus bulls, adaptability study. Carcasses of bulls in the open line had less outside fat and a lower yield grade but the closed line carcasses had less kidney fat. Most of the traits measured were quite similar. The results are summarized in Table 6.

F. Performance of replacement heifers.

Heifers born in 1970. These heifers were managed and fed to gain one pound per head daily until they were two years of age. During winters they were fed limited amounts of concentrates and molasses on native pasture. The pasture furnished very little feed during winter. During spring, summer, and autumn heifers were run on permanent pastures.

Table 7 summarizes the performance of the heifers in the different studies. Fat thickness was identical between lines within breed. Growth rate of Angus heifers in the fat study was the same. Low fat Brangus heifers had a slightly more rapid weight per day of age than heifers in the high fat line. Angus heifers in the adaptability had traits that were similar between the lines.

Heifers born in 1971. These heifers were managed in the same way as described for the 1970 heifers. Angus heifers in the closed line adaptability grew faster than contemporaries in the open line. The high fat Angus heifers were slightly heavier and had a faster growth rate than Angus heifers in the low fat line. Low fat Brangus heifers have consistently grown at a faster rate than the high fat heifers. Performance is summarized in Table 8.

G. Weights of cows in 1971.

It appears from the 1971 weights of the cows in the fat study that those in the low fat line tend to be somewhat heavier. This study has been in progress seven years. Table 9 summarizes the spring and fall weights of the cows for 1971.

V. IMPROVEMENT OF FACILITIES:

1. Repaired pens at annex for working and holding cattle.
2. Eight bridges were repaired and drainage ditches cleaned.
3. Concreted floors of six pens for dry-lot feeding of cattle and

- rearranged feed troughs to allow a larger alley for feeding.
4. State and U. S. Government working together dredged canal across the marsh at the annex. This was part of an area drainage improvement program.

VI. FUTURE PLANS:

1. The projects will be continued as outlined.
2. Improvement of facilities:
 - a. Construct roof over chute at annex so that it may be used during rain and inclement weather.
 - b. Build two holding pens with loading chutes at different places at annex to keep from having to drive cattle across a busy highway and two railroads and also to keep from having to drive sick or injured cattle long distances (1.25 miles).
 - c. Rearrange pens at R.O.P. barn to increase the number of animals to be fed.

VII. PUBLICATIONS:

DeRouen, T. M., D. C. Meyerhoeffer, W. L. Reynolds, H. C. Gonsoulin, N. T. Poche' and A. M. Mullins. 1971. Selection for adaptability in beef cattle to the Gulf Coast area. Eleventh Livestock Producers' Day Report, Animal Science Department. Louisiana State University, pp. 83.

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DeRouen, T. M., W. L. Reynolds, N. T. Poche', H. C. Gonsoulin and D. C. Meyerhoeffer. 1971. Mortality of newborn beef calves in the Gulf Coast area. Gulf Coast Cattleman. September issue. (Reprinted from Louisiana Agriculture).

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Reynolds, W. L., T. M. DeRouen, H. C. Gonsoulin and D. C. Meyerhoeffer. 1971. Wintering programs for weanling heifers. Eleventh Livestock Producers' Day Report, Animal Science Department, Louisiana State University, pp. 149.

Reynolds, W. L., T. W. Shite, D. C. Meyerhoeffer and T. M. DeRouen. 1971. Effects of previous treatment on subsequent rate of growth. Louisiana Cattleman, October issue, pp. 7.

Reynolds, W. L., W. C. Foote, R. A. Bellows, T. M. DeRouen, T. W. White and D. C. Meyerhoeffer. 1971. Effects of progesterone implants on reproduction of cows. J. Anim. Sci. 33:266. (Abstr.).

VIII. PUBLICATIONS PLANNED:

Performance of straight-bred and strains of crossbred cattle -- Brangus, Angus, Brahman, Africander-Angus -- at the Iberia station.

TABLE 1. PALPATION 1971
(SEPT. 30, OCT. 1, 1971)

Breed	Line	No. Cows Exposed	Percent Pregnant
Brangus	Hi fat	64	81
Brangus	Lo fat	56	91
Angus	Hi fat	52	85
Angus	Lo fat	63	92
Angus	Closed adapt.	52	85
Angus	Open adapt. ^a	32	72

^a Bred artificially.

TABLE 2. PALPATION OF YEARLING^a HEIFERS
BORN 1970

Breed	Line	No. cows Exposed	No. Pregnant	Avg. Wt.(lbs.)	% Preg.
Brangus	Hi fat	4	2	725	50
Brangus	Lo fat	3	0	755	0
Angus	Hi fat	5	3	656	60
Angus	Lo fat	3	3	680	100
Angus	Closed Adapt.	1	1	600	100
Angus	Open Adapt.	0	0	0	0

^a Average age at beginning of breeding season was 14 months.

TABLE 3. SUMMARY OF CALVING FOR 1971

Breed Line Study	Brangus Fat Lo	Brangus Fat Lo	Angus Fat Lo	Angus Fat Lo	Angus Adapt. Closed	Angus Adapt. Open
Losses 1st 72 hrs.						
Bulls	1	1	0	0	1	1
Heifers	1	1	0	0	1	0
No. dead	2	2	0	0	2	1
% dead	4	5	0	0	5	4
Losses after 72 hrs.						
Bulls	1	0	2	0	1	2
Heifers	2	1	1	0	0	0
No. dead	3	1	3	0	1	2
% dead	6	2	7	0	2	7
Number born	48	42	42	53	39	27
Number dead	5	3	3	0	3	3
% dead	10	7	7	0	8	11

TABLE 4. COW PRODUCTION 1971

Breed Line Study	Brangus			Angus			Angus		
	Fat Hi	Fat Lo	Fat Hi	Fat Lo	Fat Hi	Fat Lo	Adapt. Closed	Adapt. Open	
No. cows exposed	62	57	56	64	56	64	53	32	
No. calves born ^a	49	41	42	53	39	53	39	27	
Avg. birth wt. (lbs.)	63	66	64	60	59	59	59	59	
No. calves weaned	43	37	39	52	35	52	35	24	
% calves weaned	88	90	93	98	90	98	90	89	
Avg. wn. wt. (lbs.)	179	178	179	180	180	180	180	180	
Actual wn. wt. (lbs.)	366	380	314	309	299	299	299	264	
Adj. wn. wt. (lbs.) ^b	440	452	373	369	352	369	352	312	
Adj. wn. ADG (lbs.) ^b	1.84	1.88	1.51	1.51	1.42	1.51	1.42	1.23	
Grades conformation ^c	10.5	10.8	11.1	10.8	11.4	10.8	11.4	10.3	
Condition ^c	9.5	9.4	9.1	8.9	9.4	8.9	9.4	8.1	
Fat thickness (mm)	3.8	3.8	3.7	3.7	--	--	--	--	
Index ^d	116	118	106	105	105	105	105	93	

^a Includes live and dead calves.^b Adjusted for sex of calf and age of dam.^c Good = 9, 10, 11; standard = 6, 7, 8.^d Equal emphasis to growth and to conformation.^e Artificially inseminated.

TABLE 5. POSTWEANING PERFORMANCE OF BULLS FED IN 1970-71.

Breed study line	Brangus		Angus		Angus	
	Fat ^e Hi	Fat ^f Low	Fat ^g Hi	Fat ^h Low	Adapt. closed	Adapt. open
No. fed	20	17	22	25	17	7
Avg. initial wt. (lbs.)	385	386	324	320	307	298
No. days fed	184	176	207	213	184	184
Avg. final wt. (lbs.)	779 ^a	794 ^a	773 ^a	777 ^a	685 ^d	722 ^d
ADG on test (lbs.)	2.20	2.35	2.18	2.18	2.06	2.30
Avg. age end test (days)	365	354	386	393	365	365
Avg. type score ^b	11.0	11.5	12.1	11.8	11.8	12.1
Avg. condition score ^c	9.9	10.5	11.5	11.4	11.1	11.2
Fat thickness (mm) ^c	4.6	5.0	5.6	4.9	--	--
Fat thickness (in.)	0.18	0.20	0.22	0.19	--	--
% Zebu	39.84	41.22	--	--	--	--
% Inbreeding	1.83	1.24	0.99	--	0.83	--
Index	--	--	--	--	101	102

^a Each bull fed to a constant weight of 800 lb.

^b Choice = 12, 13, 14; Good = 9, 10, 11.

^c Measured when each bull weighed 800 lbs.

^d Each bull weighed at a constant age of 365 days.

^e 5 bulls did not weigh 800 lbs. at 400 days of age.

^f 2 bulls did not weigh 800 lbs. at 400 days of age.

^g 5 bulls did not weigh 800 lbs. at 400 days of age.

^h 4 bulls did not weigh 800 lbs. at 400 days of age.

TABLE 6. SLAUGHTER DATA OF BULLS 1970-71

Breed study line	Brangus		Angus		Angus	
	Fat Hi	Fat Lo	Fat Hi	Fat Lo	Adapt. Closed	Adapt. Open
No. slaughtered	14	11	14	18	13	4
Final wt. (lbs.) ^a	818	856	812	827	748	789
Slaughter age (days)	443	437	442	444	442	439
Days fed	256	255	260	266	258	253
ADG (lbs.)	1.77	1.94	1.94	1.92	1.76	1.99
Slaughter wt. (lbs.) (b)	805	842	798	813	735	776
Slaughter scores:						
Type	10.0	10.8	12.0	11.9	11.6	12.3
Condition	8.8	9.7	11.0	10.6	10.7	10.6
Carcass wt., warm (lbs.)	483	506	484	496	456	477
Dressing %, warm	59.8	60.0	60.5	60.8	61.9	61.5
Carcass grades: (c)						
Conformation	12.5	12.9	14.1	13.9	13.8	14.2
Composite	7.1	8.8	7.9	8.7	8.7	8.5
Quality	7.1	8.8	7.9	8.7	8.7	8.5
Yield	1.17	1.52	1.46	1.46	1.54	1.52
Marbling (d)	3.8	5.9	3.9	4.8	5.2	5.2
Kidney fat % (d)	1.4	1.7	1.4	1.5	1.5	1.8
REA, sq. ins.	11.9	11.4	11.4	11.7	11.1	11.7
REA/100 lbs. carcass	2.47	2.26	2.38	2.38	2.44	2.44
Shear 1" core	23.6	22.6	16.5	20.8	21.8	21.3
Fat thickness (mm) (e)	5.8	5.3	4.9	5.7	6.6	5.5
Fat thickness, ins. (e)	0.23	0.21	0.19	0.22	0.26	0.22
Car. wt/day of age (lbs.)	1.09	1.16	1.09	1.12	1.03	1.09

- a. Weight at end of test.
- b. Weight just before slaughter at plant (estimated).
- c. Avg. standard = 7; avg. good = 10; choice = 13.
- d. Estimated by grader.
- e. Measured from rib eye tracings at 3 places and averaged.

TABLE 7. SUMMARY OF PERFORMANCE OF HEIFERS BORN IN 1970
(Average Age = 18 Months)

Breed Study Line	Angus Adapt. Closed	Angus Adapt. Open	Angus Fat Hi	Angus Fat Lo	Angus Fat Hi	Angus Fat Lo	Brangus Fat Hi	Brangus Fat Lo
Number of heifers	18	4	17	17	15	15	10	10
Average weight (lbs.)	532	542	569	576	623	623	644	644
Average age (days)	539	543	544	555	541	541	525	525
Wt./day of age (lbs.)	0.99	1.00	1.04	1.04	1.15	1.15	1.23	1.23
Fat (mm)	--	--	1.8	1.8	1.5	1.5	1.5	1.5
Type score (a)	11.2	11.7	11.2	11.2	11.3	11.3	10.8	10.8
Condition score (a)	7.4	7.7	7.8	7.5	8.1	8.1	7.8	7.8

a. Scores: Avg. standard = 7; avg. good = 10; avg. choice = 13.

TABLE 8. SUMMARY OF PERFORMANCE OF HEIFERS BORN IN 1971
(Average Age = 10 Months)

Breed Study Line	Angus Adapt. Closed	Angus Adapt. Open	Angus Fat Hi	Angus Fat Lo	Angus Fat Hi	Angus Fat Lo	Brangus Fat Hi	Brangus Fat Lo
No. of heifers	14	9	13	17	17	17	17	17
Avg. weight (lbs.)	390	357	428	412	440	440	465	465
Avg. age (days)	306	306	311	328	304	304	300	300
Wt./day of age (lbs.)	1.27	1.17	1.38	1.26	1.45	1.45	1.55	1.55

TABLE 9. SUMMARY OF WEIGHTS OF COWS IN 1971

Breed Study Line	Angus Adapt. Closed	Angus Adapt. Open	Angus Fat Hi	Angus Fat Lo	Angus Fat Hi	Angus Fat Lo	Brangus Fat Hi	Brangus Fat Lo
Number	53	32	56	64	62	62	57	57
Spring Wt. (lbs.)	817	808	826	847	952	952	990	990
Fall Wt. (lbs.)	826	773	793	810	902	902	986	986
Overall Wt. (lbs.)	822	790	810	828	927	927	988	988

State Louisiana

Location	Iberia Station, Jeanerette, La.		
Breed of sire	Angus	Angus	
Breed of dam	Angus	Angus	
Line or group ¹	Closed Adapt.	Open ⁶ Adapt.	
Percent used in project	100	100	
Inventory as of July 1, 1972	Cows 2 years and over Yearling heifers Bulls and steers under 1 year Heifers under 1 year Bulls over 1 year Steers over 1-year	65 14 14 25 8 0	34 9 6 9 0 0
Repro. perf.	Percent pregnant ² Calf survival percent ³	85 90	72 89
Wean. perf.	Adj. ADG ⁴ Ave. type sc. ⁵	1.42 11.4	1.23 10.3
Postweaning performance	No. of bulls No. of heifers No. of steers	17 0 0	7 0 0
Slaughtered performance	No. of bulls No. of heifers No. of steers	13 0 0	4 0 0
Remarks			

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments: sex of calf and age of dam.⁵ Suggest S-10 scoring system; indicate if different.
S-10-1 (Rev.) ⁶ Bred artificially.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Louisiana

Location		Iberia Station, Jeanerette, La.			
Breed of sire	Brangus	Brangus	Angus	Angus	
Breed of dam	Brangus	Brangus	Angus	Angus	
Line or group ¹	Hi Fat	Lo Fat	Hi Fat	Lo Fat	
Percent used in project	100	100	100	100	
Inventory as of July 1, 1972	Cows 2 years and over	64	60	55	78
	Yearling heifers	17	17	13	17
	Bulls and steers under 1 year	20	23	15	25
	Heifers under 1 year	19	20	18	27
	Bulls over 1 year	9	8	9	8
	Steers over 1-year	0	0	0	0
	Percent pregnant ²	81	91	85	92
Repro. perf.	Calf survival percent ³	88	90	93	98
	Adj. ADG ⁴	1.84	1.88	1.51	1.51
Wean. perf.	Ave. type sc. ⁵	10.5	10.8	11.1	10.8
Postweaning performance	No. of bulls	20	17	22	25
	No. of heifers	0	0	0	0
	No. of steers	0	0	0	0
	No. of bulls	14	11	14	18
	No. of heifers	0	0	0	0
	No. of steers	0	0	0	0
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: sex of calf and age of dam.

⁵ Suggest S-10 scoring system; indicate if different.

MISSISSIPPI STATE UNIVERSITY
State College, Mississippi

I. PROJECT: Hatch 3-207-666

A study to Determine the Breeding Worth of Inbred and Outbred Bulls from Various Sources.

II. OBJECTIVES:

To compare pre- and postweaning growth rates, market grades, carcass qualities and maternal ability of the progenies of potentially superior sires selected from various sources.

III. PERSONNEL:

Fay Hagan and L. J. Smithson

IV. ACCOMPLISHMENTS DURING THE YEAR:

1971 breeding was the fifth year that calves have been produced in this project. Postweaning and carcass data were obtained on steers born in 1971 and slaughtered June 2, 1972.

The numbers of line females which have been produced and are being mated to bulls of different lines in 1972 are shown in Table 1. Heifers from the type and growth lines as well as the control line are being bred to bulls in the same line as the females.

TABLE 1. 1972 BREEDING PLANS FOR "LINE"
HEIFERS AND COWS

Sire Line of Female	(Breeding group for 1972 breeding season)			
	1	2	3	4
1	--	12	10	10
2	8	--	10	8
3	10	6	--	6
4	8	8	7	--
Totals by line	26	26	27	24

The following tables (2-4) present pre- and postweaning data summaries.

TABLE 2. PREWEANING PERFORMANCE OF 1971 CALF CROP

Sire Line	Birth weight ^a	A.D.G. ^a	Weaning Grade	210-day ^a Weight	% Cows Calving	% Weaning Calves	No. Calves
1	64.0	1.62	11.8	404	89.5	89.5	17
2	59.7	1.50	10.8	372	85.7	85.7	18
3	62.7	1.59	11.3	396	82.6	65.2	15
4	64.0	1.55	11.4	394	71.4	52.8	13
7 (type)	72.2	1.55	11.0	398	43.8	37.5	6
8(growth)	62.7	1.56	11.3	394	71.4	61.9	13
Control	59.5	1.62	11.6	398	58.3	54.2	13

^a Heifer calves adjusted to steer basis.

TABLE 3. AVERAGE PREWEANING PERFORMANCE FOR 5 YEARS, 1967-1971

Line	Birth wt.	A.D.G.	210-Day Wt.	Weaning grade
1	60.2	1.59	394	11.5
2	58.3	1.55	384	10.9
3	64.4	1.57	394	11.0
4	61.7	1.52	381	11.0
7	66.3	1.61	404	11.3
8	62.1	1.61	400	11.6

TABLE 4. POSTWEANING PERFORMANCE OF 1970 STEERS

Sire Line	No. of Steers	Wt. on Winter Ration	A. D. G. Winter Ration	Finishing Ration	A.D.G. Finishing Ration	Wt. at Slaughter	Lb. Feed Per lb. of Gain
1	5	351	1.37	509	2.17	729	9.956
2	2	368	2.12	612	2.02	810	11.667
3	5	431	1.39	591	2.15	824	10.166
4	5	319	1.75	520	2.10	740	10.523
7	5	420	1.58	602	1.74	814	12.567
8	5	408	1.66	599	2.40	873	11.262
Control	5	329	1.68	522	1.75	738	12.768

Steers born in 1970 were slaughtered June 24, 1971. They were on a wintering ration for 115 days and a finishing ration for 111 days.

V. FUTURE PLANS:

1972 is the last breeding season for this project. Collection of preweaning and postweaning data will be finished with the slaughter of the 1973 steers.

VI. PUBLICATIONS DURING THE YEAR:

None.

VII. PUBLICATIONS PLANNED:

Analysis and results will be published when data are complete.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State Mississippi

<u>Location</u>	Prairie			
<u>Breed of sire</u>	Angus			
<u>Breed of dam</u>	Angus			
<u>Line or group¹</u>				
<u>Percent used in project</u>	100			
<u>Inventory as of July 1, 1972</u>	Cows 2 years and over	196		
	Yearling heifers	49		
	Bulls and steers under 1 year	85		
	Heifers under 1 year	88		
	Bulls over 1 year	11		
	Steers over 1-year	42		
<u>Repro. perf.</u>	Percent pregnant ²			
	Calf survival percent ³			
<u>Wean. perf.</u>	Adj. ADG ⁴			
	Ave. type sc. ⁵			
<u>Postweaning performance</u>	No. of bulls			
	No. of heifers			
	No. of steers	42		
<u>Slaughtered</u>	No. of bulls			
	No. of heifers			
	No. of steers	42		
<u>Remarks</u>				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

NORTH CAROLINA STATE UNIVERSITY
Agricultural Experiment Station
Raleigh, North Carolina

I. PROJECT: Animal Science 1010

Direct and Correlated Response to Selection for Weaning Weight and Postweaning Gain.

II. OBJECTIVES:

To measure the effectiveness of selection to increase 205-day weight and postweaning gain to 365 days and to evaluate correlated responses in other traits.

To investigate phenotypic and genetic relationships between growth and milk production.

III. PERSONNEL:

E. U. Dillard, O. W. Robison, J. E. Legates, J. J. Rutledge and T. N. Blumer.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Although this is a long-term project and approximately one third of the cows and heifers calving in 1972 were born before lines were established and before foundation sires were used, it is of interest to see if responses to selection are evident. For the sires selected from the 1968 calves and producing progeny in 1971 the evidence that selection was effective when weaning weight is considered is quite good, but selection for postweaning gain of bull calves fed to one year of age is less convincing.

In comparing performance of the selected sires and their sons on test the following data is of interest:

The weighted selection differential of sires in the weaning weight line (line 1) was +54 pounds for weaning weight and +59 pounds for gain from 205 to 365 days of age. Those of the gain line (line 2) were +1 and +53, while those of the control (line 3) bulls were negative, -13 and -19 pounds, for the two traits. Shown in the

table below is the performance of all calves weaned and of the bull progeny of the selected sires measured as deviations from the performance of progeny of the control sires.

TABLE I

Herd	Line	No.	Deviations from control		Deviations from control	
			in gain	No.	in gain	No.
Raleigh	1	31	+ 8 lbs.	7	+57 lbs.	
	2	30	+12 lbs.	19	+19 lbs.	
	3	14	Avg. wt. 407 lbs.	4	Avg. gain 358 lbs.	
Plymouth	1	41	+ 5 lbs.	21	+11 lbs.	
	2	35	+17 lbs.	19	+23 lbs.	
	3	19	Avg. wt. 370 lbs.	10	Avg. gain 355 lbs.	

It is recognized that the number of animals per line in feedlot is quite small, especially in the control line.

The third set of selected young sires were used in 1971, thus completing one complete set of selected sires. At Plymouth 151 cows were available for breeding in 1971 and there were 135 in Raleigh. Difficulties in getting sufficient cows and heifers bred has been a hindrance to applying selection pressure on females and is the principal reason many of the foundation cows remain in the herds. As a general rule, only in the case of yearling heifers are females that fail to conceive kept when open.

In most years we have had at least one young bull with fertility problems, necessitating the use of an alternate. In a restricted breeding season this usually results in a lower percentage calf crop two years in succession. There is some evidence to indicate that the semen of some bulls does not stand freezing very well.

A total of 80 young bulls were fed for postweaning gain and feed efficiency evaluation from the 1971 calf crop. Sixty-two of these were slaughtered and carcass data obtained.

As a result of the study by Rutledge *et al.*, milk production of cows in the herd is routinely estimated by the calf nursing technique with milk weights estimated at three periods during lactation - during

the first, third and fifth or second, fourth and sixth month. With this system the nursing and weighing is done every other month beginning during the second month of the calving season.

V. FUTURE PLANS:

This experiment will be continued as planned.

VI. PUBLICATIONS:

Rutledge, J. J., O. W. Robison, W. T. Ahlschwede and J. E. Legates. 1971. Milk yield and its influence on 205-day weight of beef calves. *J. Anim. Sci.* 33:563.

Rutledge, J. J., O. W. Robison, W. T. Ahlschwede and J. E. Legates. 1972. Estimating milk yield of beef cows. *J. Anim. Sci.* 34:9.

Vesely, J. A. and O. W. Robison. 1971. Conventional selection indexes for birth and weaning traits in beef calves. *J. Anim. Sci.* 33:537.

Vesely, J. A. and O. W. Robison. 1972. Empirical selection indexes for beef cattle. *J. Anim. Sci.* 34:549.

VII. COOPERATING AGENCIES:

North Carolina Department of Agriculture

I. PROJECT: Animal Science 5201

Evaluation of Rotational Crossbreeding of Angus, Charolais and Hereford for Beef Production.

II. OBJECTIVES:

To compare a three-breed rotational crossbreeding program with straightbreeding of Hereford cattle for (1) fertility, (2) calf viability, (3) weaning weight, (4) feedlot and carcass merit and (5) mature weight.

III. PERSONNEL:

E. U. Dillard, J. E. Legates and T. N. Blumer.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Two hundred ninety-five calves of breeds and crosses specified in the design were weaned in the herds of this project in 1971 and forty steer progeny were moved to Raleigh for postweaning gain, slaughter and carcass evaluation.

As in previous years the ranking of the calves in ascending order on adjusted 205-day weights were Grade Hereford, Angus x Hereford, Charolais x Angus x Hereford, and Angus or Hereford sired calves from three-breed dams. There was, however, some variation between the two herds. In one herd the heaviest calves were the three-breed-cross calves. This herd apparently was short on pasture in 1971 and the average weaning weight of all calves was approximately 50 lbs. lighter than in 1970. On the theory that for a crossbred calf or cow to make efficient use of its heterosis it must be furnished adequate nutrients one might speculate that the crossbred cows, and perhaps to some extent the calves, may not have received sufficient forage to allow them to express their potential in either milk production or gain. There does seem to be some indication of a reduction in weight of calves when using either a Hereford or Angus sire for the second time following the other, i.e., H x (A x 3-way cross) or A x (H x 3-way cross.) Up to the present time too few calves have been produced when the Charolais was used for the second time to indicate where this group would rank.

A criticism that has sometimes been made of the Charolais breed has been that reproductive performance was low. Although this project has no purebred Charolais females, the calving data on all cows produced

in these herds containing any Charolais breeding were compared with those for all cows that did not possess Charolais breeding. Of 405 Charolais cows exposed 327 or 80.7 percent calved, whereas, for 668 cows possessing Charolais breeding 529 cows or 79.1 percent calved. There is no indication of adverse effects on percent calf crop of this breed, at least in one-half and one-quarter bred cows.

V. FUTURE PLANS:

This project will be continued as planned for at least two more years in order that sufficient calves sired by Charolais bulls in the second cycle of the rotation will be provided for appraisal.

VI. PUBLICATIONS:

None.

VII. COOPERATING AGENCIES:

North Carolina Hospital Board of Mental Health

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State North Carolina

Location	Plymouth	Plymouth	Plymouth	Raleigh	Raleigh
Breed of sire	Grade Hereford	Grade Hereford	Grade Hereford	Grade Hereford	Grade Hereford
Breed of dam	Grade Hereford	Grade Hereford	Grade Hereford	Grade Hereford	Grade Hereford
Line or group ¹	1	2	3	1	2
Percent used in project	100	100	100	100	100
Inventory as of July 1, 1972	Cows 2 years and over	46	51	19	44
	Yearling heifers	17	17	7	22
	Bulls and steers under 1 year	21	28	9	18
	Heifers under 1 year	24	13	10	19
	Bulls over 1 year	--	--	--	6
	Steers over 1-year	--	--	--	--
	Percent pregnant ² '70 Breeding	76.3	72.9	79.3	69.8
Repro. perf.	Calf survival '71 percent ³ Calves	91.1	83.7	82.6	86.5
	Adj. ADG ⁴	1.45	1.51	1.42	1.63
	Ave. type sc. ⁵	9.6	9.9	9.2	9.8
Postweaning performance	No. of bulls	21	19	10	7
	No. of heifers	--	--	--	--
	No. of steers	--	--	--	--
Slaughtered	No. of bulls	17	15	5	5
	No. of heifers	--	--	--	--
	No. of steers	--	--	--	--
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

Percent of calves born (dead and alive) that survived to weaning.

The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: Adjusted for sex and age of dam with new factors calculated from N.C.B.C.I.A. data - lower factors than previously used.

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971 - 72

State North Carolina

Location	Raleigh			
Breed of sire	Grade Hereford			
Breed of dam	Grade Hereford			
Line or group ¹	3			
Percent used in project	100			
Inventory as of July 1, 1972	Cows 2 years and over Yearling heifers Bulls and steers under 1 year Heifers under 1 year Bulls over 1 year Steers over 1-year	23 7 7 8 6 --		
Repro. perf.	Percent pregnant ² '70 Breeding Calf survival '71 percent ³ Calves	53.8 85.7		
Wean. perf.	Adj. ADG ⁴ Ave. type sc. ⁵	1.60 9.7		
Postweaning performance	No. of bulls No. of heifers No. of steers	4 -- --		
Slaughtered performance	No. of bulls No. of heifers No. of steers	3 -- --		
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments: Adjusted for sex and age if dam with new factors

⁵ calculated from N.C.B.C.I.A. data- lower factors than previously used.

Suggest S-10 scoring system; indicate if different.

CLEMSON UNIVERSITY
Agricultural Experiment Station
Clemson, South Carolina

I. PROJECT:

The response of sire progenies to management and feeding procedures.

II. OBJECTIVES:

To investigate the response of sire progenies, as measured by live animal and carcass traits to methods of producing slaughter cattle.

To evaluate the magnitude and importance of the average genotype with certain environmental influences.

To develop, through selection, herds of beef cattle with superior performance under South Carolina conditions.

III. PERSONNEL:

W. C. Godley, J. R. Hill, Jr., G. C. Skelley, Jr., R. M. Rauton, and R. F. Wheeler.

IV. ACCOMPLISHMENTS DURING THE YEAR:

One hundred fifty-six Angus cows were bred to produce the 1971 calf crop. Approximately 82 percent of these cows weaned a live calf, a six percent increase over the previous year. Five percent of the cows calving had calves that were dead at birth or died within the first 36 hours after calving, eight percent less than the previous year. Fifty-six steer calves representing seven sire groups were fed on a ROP test and extensive carcass data were taken. Four bull calves representing the progeny of two sires entered the South Carolina Bull Gain test.

V. FUTURE PLANS:

A new project will be initiated during the next year.

VI. PUBLICATIONS:

None.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State South Carolina

<u>Location</u>	Clemson			
<u>Breed of sire</u>	Angus			
<u>Breed of dam</u>	Angus			
<u>Line or group¹</u>	Purebred			
<u>Percent used in project</u>	100			
<u>Inventory as of July 1,</u>	Cows 2 years and over	100		
	Yearling heifers	45		
	Bulls and steers under 1 year	44		
	Heifers under 1 year	48		
	Bulls over 1 year	29		
	Steers over 1-year	0		
<u>Repro. perf.</u>	Percent pregnant ²	89.67		
	Calf survival percent ³	90.71		
<u>Wean. perf.</u>	Adj. ADG ⁴	1.99		
	Ave. type sc. ⁵	11.47		
<u>Postweaning performance</u>	No. of bulls	4		
	No. of heifers	45		
	No. of steers	56		
<u>Slaughtered performance</u>	No. of bulls	0		
	No. of heifers	0		
	No. of steers	56		
<u>Remarks</u>				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF TENNESSEE
Agricultural Experiment Station
Knoxville, Tennessee

I. PROJECT: H-306 (S-10)

Effects of selection to improve growth rate in beef cattle.

II. OBJECTIVES:

To measure the effectiveness of selection to improve growth rate to a year of age and the effects such selection will have on other traits.

To investigate phenotypic and genetic relationship between growth rate and other variables.

To investigate various methods of improving the accuracy of assessment of growth rate.

To study inbred beef cattle with the aid of immunogenetic markers.

III. PERSONNEL:

R. R. Shrode, S. P. Hammack, J. A. Odom, J. H. Felts and W. T. Butts, Jr.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Yearling performance data from 669 Angus and 871 Hereford bulls from three central test stations and seven Land Grant University or USDA research herds were analyzed by generalized least-squares multiple regression procedures and by principal-components analysis. In addition to the usual weight and gain variables, measures of fatness and of skeletal size were included in the records from several of the ten data sources. Results of the analysis show conclusively that weight alone adjusted for age and age of dam is not sufficient as a measure of size in evaluating yearling bulls. Ultrasonically measured subcutaneous fat thickness and various measures of skeletal size make possible much more accurate discrimination among bulls with respect to size than is possible using weight alone.

The Hereford herd at Greeneville now contains 120 females of breeding age. Hence, the herd was divided into two groups, one of which will serve as a control herd. Each 60-cow group will be bred to four bulls. Thus, the same design and breeding plan will prevail

in the Hereford herd as is used in the Angus herd at Crossville. In the original project proposal it was indicated that this change would be initiated with the Hereford herd when feasible.

V. FUTURE PLANS:

Continuation of planned procedures and accumulation of data to contribute to accomplishment of stated objectives. During the year body measurements of cows older than one year will be recorded to contribute to a study of age trends in body dimensions.

VI. PUBLICATIONS DURING THE YEAR:

Eller, A. L., Jr. 1972. The utility of measure of fatness and skeletal size in explaining weight and size differences in yearling Angus and Hereford bulls. Ph.D. Dissertation, University of Tennessee.

Jamison, H. M., M. D. Austin and R. R. Shrode. 1972. Factors influencing weaning performance of beef calves in the plateau area of Tennessee. Tenn. Farm and Home Sci., Prog. Rpt 81, Jan., Feb., Mar., 1972:19-21.

Stricklin, W. R. 1972. An analysis of the responses of young beef cattle to restraint in a squeeze chute. M. S. Thesis. Univ. of Tenn.

VII. PUBLICATIONS PLANNED:

Journal papers from the dissertation and thesis listed above.

State Tennessee

Location	PES	PES	TES	
Breed of sire	Angus	Angus	P. Hereford	
Breed of dam	Angus	Angus	P. Hereford	
Line or group ¹	Inbred	Non-Inbred	Non-Inbred	
Percent used in project	100%	100%	100%	
Inventory as of July 1,	Cows 2 years and over	48	168	101
	Yearling heifers	14	46	31
	Bulls and steers under 1 year	13	61	42
	Heifers under 1 year	13	67	39
	Bulls over 1 year	14	77	29
	Steers over 1-year			
Repro. perf.	Percent pregnant ²	82	92	94
	Calf survival percent ³	92	94	90
Wean. perf.	Adj. ADG ⁴	1.72	1.87	1.70
	Ave. type sc. ⁵	12.70	12.60	12.80
Postweaning performance	No. of bulls			
	No. of heifers			
	No. of steers			
Slaughtered performance	No. of bulls			
	No. of heifers			
	No. of steers			
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

TEXAS A&M UNIVERSITY
Agricultural Experiment Station
College Station, Texas

I. PROJECT: H-2101

Breeding methods for beef cattle in the southern region.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

T. C. Cartwright (leader), H. A. Fitzhugh, Jr., and R. C. Thomas.

IV. ACCOMPLISHMENTS DURING THE YEAR:

A. Characteristics of bulls slaughtered near optimal weight.

Growth and carcass data were collected on 109 straightbred and crossbred bulls from the 1969-1970 calf crop at McGregor. Each bull was slaughtered when his rate of gain began to decrease appreciably. The purpose of this procedure was to slaughter all bulls on a maturity constant basis determined indirectly from change in rate of gain and degree of body fatness and evaluate the effects of breed or cross on growth and carcass characters. Variation between breeds for several growth and carcass characters remained when degree of variation in proportion of mature weight attained at slaughter was reduced. Breed effects were found to be significant for several of the growth and carcass characters including lifetime rate of gain, warm carcass weight, ribeye area and final grade.

Ultrasonic measurements on these bulls, using a Model 621 Scanogram, of area of l. dorsi muscle and fat thickness over the l. dorsi between the 12th and 13th rib were compared to actual carcass estimates. Significant breed differences were found for actual carcass area and estimated area of the l. dorsi ($P < .01$ and $P < .05$, respectively). The correlation between carcass and ultrasonic area of the l. dorsi was 0.83 overall and 0.77 adjusted for breed and season. The corresponding correlations between carcass and ultrasonic fat thickness over the l. dorsi were 0.82 and 0.77, respectively. Between-breed-means correlations of 0.96 and 0.95

indicate a high degree of accuracy of the Scanogram when used to predict average loin-eye area and average fat thickness of a number of animals. Also, Scanogram estimates of fat thickness at the shoulder and rump were positively correlated to related carcass measurements and scores.

B. Growth and other characteristics of the pelvic inlet.

Calving difficulty, or dystocia, is a major source of concern to cattlemen because of the labor required and possible loss due to injury, or death of the cow and calf. Emphasis on increased growth rate appears to have increased the incidence of calving problems. One potential source of these differences in degree of dystocia is the size and shape of the pelvic inlet.

The conformation of the pelvic inlet of beef heifers was observed monthly from weaning (7 to 8 months of age) until first calving (22 to 25 months of age). Measurements of the pelvic inlet were also made on females at maturity (4 years). Measurements including internal pelvic width and height and body weight were made for a total of 65 heifers, including Angus, Santa Gertrudis, Jersey, Hereford and Charolais breeds and their crosses under Project S-1718, "Selected Parameters of Reproductive Efficiency in Beef Cattle."

Breed types were grouped according to similarity of pelvic dimensions prior to first mating. The percentage of a specific breed in a given breed type generally, but not always, coincided with the classification according to pelvic dimensions. The width/height ratio tended to increase as the heifers matured, but in general height exceeded width. Ranking of breed types according to individual pelvic dimensions (W or H) and shape (W/H) of the pelvic inlet at 365 days of age provided an accurate indication of their breed type ranking at first parturition. Individual heifers tended to retain the characteristic shape of their breed from 365 days of age to maturity. Pelvic height, width and area increased linearly from 365 days of age to first parturition in such a manner that shape was not greatly changed and rankings of individuals based on pelvic dimensions at 365 days of age were similar to those at first parturition. Weight was correlated with pelvic dimensions at 365 days and at first parturition but was not a satisfactory substitute for actual pelvic measurements. Pelvic dimensions at parturition can be estimated accurately from measurements taken before first breeding with useful accuracy. The multiple correlation between pelvic area at parturition and pelvic width, height and body weight at 365 days of age was 0.72. Degree of variation in pelvic width and height at maturity associated with variation in body weight at maturity approached zero.

C. Changing the shape of growth curves.

The antagonism between rapid, efficient early growth of slaughter cattle and efficiency of maintaining the cow herd from which they are produced can be partially resolved by selection to change the shape of the population growth curve. Such selection would favor cattle which grow rapidly to relatively small size at maturity.

The illustrated method of changing the shape of the growth curve was to increase degree of maturity (u_{12}) at 12 months. Selection indices to accomplish this objective were computed using genetic and phenotypic statistics for weight (y) and degree of maturity at birth, six, 12 and 18 months and maturity, which were published by Fitzhugh and Taylor (1971).

Selection indices and predicted responses for the three different selection criteria were compared. These criteria were:

1. Selection for weight at 12 months, y_{12} , corresponding closely to common practice.
2. Selection for weight at 12 months, holding mature weight unchanged, $y_{12}.A$.
3. Selection for degree of maturity at 12 months, u_{12} .

Responses to selection for one generation for these three different criteria were estimated for weight and degree of maturity at birth, six, 12 and 18 months of age and for weight at maturity. The index selection differentials equalled 1.0 in all cases.

Selection using the index for y_{12} would increase weight at all ages by approximately 3 to 4 percent. The desirable 4.11% increase in y_{12} (9 kg) would be accompanied by the less desirable 3.07% increase (15 kg) in mature weight. Selection for y_{12} increased degree of maturity at all ages except birth, i.e. early weights were generally increased relatively more than mature weight.

Selection for 12-month weight, while simultaneously restricting weight at maturity to no change, increased y_{12} by 3.03%, roughly 3/4 the response expected from unrestricted selection for y_{12} . Selection for degree of maturity at 12 months, u_{12} , sharply decreased the expected response for y_{12} compared to direct selection for y_{12} . The major effect of selecting for u_{12} would appear to be decreased weight at maturity. Note also that the accompanying decrease in birth weight, y_B , which reflects the relatively strong genetic relationship between weights at birth and maturity.

Selection for $y_{12} \cdot A$ and u_{12} , which both discriminated against heavy weight at maturity, consistently increased degree of maturity. The greatest expected increase in u_{12} resulted from direct selection for u_{12} , as would be expected. This increase in u_{12} would result from combining a small increase in A . Selection for $y_{12} \cdot A$ would yield only slightly less increase in u_{12} and would do so more by increasing y_{12} .

Alternative selection criteria are available. Delaying selection until weight at maturity is available might not be practical (e.g. generation interval would be increased); indices could be based on weights at birth, six, 12, and 18 months, leaving out weight at maturity. Another alternative of practical significance would be selection for decreased birth weight relative to mature weight (i.e. decreased u_B) to reduce calving difficulties.

D. Consequences of varying genetic and environmental parameters on efficiency of production as determined from a simulation model.

Systems involving production of straightbred and F_1 progeny from small (S), medium (M) and large (L) cows; mature weights 430, 500 and 600 kg.; were simulated and evaluated using linear programming techniques. Performance data collected on Jersey, Angus, Hereford and Charolais cows and their progeny at TAMU Research Center at McGregor, supplemented by estimates of genetic and phenotypic parameters from the literature, provided a basis for the model. Straightbred and F_1 slaughter progeny were fed to a constant proportion of mature weight. Two nutritional regimes were employed to estimate and satisfy nutrient requirements. Regime I involved least cost rations balanced for DP, ME, and DM; regime II was characterized by the use of pasture and harvested forage. The model included fixed costs, relationships between cow size and progeny growth, heterosis and other considerations deemed necessary to make it trustworthy. The criterion for evaluating efficiency was net return to a fixed investment for nutrients. Average daily milk yields of 3, 5 and 7 kg. were compared.

Effect of milk yield and size. In regime I, 5 kg. was 0.2% and 1.9% more efficient than 3 and 7 kg., whereas, for II, with cows converting relatively inexpensive forage into milk, 7 kg. was 6.6% and 2.2% more efficient than 3 and 5 kg. Large cows were 3.0% and 7.2% more efficient than M and S cows, respectively, in straightbred systems under regime I, whereas, for regime II, M cows were 2.1% and 1.1% more profitable than L and S cows.

Effects of fertility and longevity. Performance data on Angus, Charolais, Hereford and Jersey cows and their straightbred and F_1 progeny provided the basis to examine the effects of varying calving

percent and productive longevity. Fixed costs, heterosis levels, relationships between mature size and growth rate, attrition rates of cows of different ages and other important factors were included. Net return to a fixed expenditure for nutrients was the measure of efficiency. Birth percents examined were 79% vs. 89% for straightbreeding and 80.2% vs. 90.3% for crossbreeding.

Net income increased and number of cows decreased with increased fertility. Income per cow was \$10 to \$15 greater for the higher fertility level. Mean relative advantages of higher fertility were 8.3% under regime I and 6.5% under regime II. Culling age was set at 9 years vs. 12 years to evaluate effects of varying productive longevity. For regime I, with relatively high nutrient costs for cows and replacement heifers, terminating cows at 9 years reduced average net income 0.6%. For regime II, with relatively low nutrient costs for breeding cattle, removing cows at 9 years increased net income by 0.5%.

E. Effects of net heterosis and complementarity.

The linear programming model was also used for evaluating the effects of hybrid vigor and complementarity on efficiency (net return) of beef production. Herd production from cows of small (S), medium (M) and (L) mature sizes; 430, 500 and 600 kg; was simulated utilizing straightbred, F_1 and two-breed rotational cross cows in selected systems. Averages set for all straightbreds were 5 kg daily milk yield and 79% annual conception rate. Nutrient costs, fixed per head costs, size, growth rate, age, culling rate, heterosis and other effects were included. Herds produced all replacements and sold culs and calves at optimal weights. All comparisons were made within confinement (I) and pasture (II) regimes.

For regime I (relatively expensive nutrients), size was a relatively important consideration. For straightbreds, L returned 8.8% and 3.6% more than S and M herds. The L rotation systems returned 7.5% and 3.2% more than S and M rotations. Size of F_1 cows, when mated to L sires, had little effect; i.e. complementarity had little effects. Systems breeding L sires to crossbred rather than straightbred cows increased return 5.0% on average. Regime II was less sensitive than regime I to size and breeding system differences. For all systems, M dams produced the greatest returns followed closely by S. Producing F_1 calves, L sires returned more; for other matings, M sires, followed closely by S sires, returned more. Crossing systems increased efficiency 4.6% on average with small differences among them except for S sires mated to L dams (1.8%) and the L rotation (2.4%).

V. FUTURE PLANS:

Project H-2101 will be replaced by the newly approved S-10 project H-1936. However, the old project will be held open a year in order to

complete analyses of data which are presently in progress. The results of these analyses will be used further, in more extensive simulation studies.

VI. PUBLICATIONS:

Brown, J. E. and T. C. Cartwright. 1971. Combining abilities of eight breeds of sires. TAES P. R. 2976.

Brown, J. E., H. A. Fitzhugh, Jr. and T. C. Cartwright. 1971. Comparison among lifetime weight-age statistics. J. Anim. Sci. 32:373. (Abstr.).

Brown, J. E., H. A. Fitzhugh, Jr., T. C. Cartwright, S. E. Carpenter and E. K. Crouch. 1971. Algebraic models for describing growth of cows, TAES P. R. 2979.

Carpenter, J. A., H. A. Fitzhugh, Jr., J. E. Brown and T. C. Cartwright. 1971. Relationships among growth curve parameters and measures of productivity in beef cows. TAES P. R. 2975.

Cartwright, T. C. 1972. Beef cattle research on hybrid vigor and performance testing. Iowa Beef Improvement Assoc. News: 3-10.

Cartwright, T. C. 1971. Breeding systems designed to maximize total efficiency of beef production. (Invitational paper translated into German). Institut fur Tierzucht und Haustiergenetick. Univ. of Göttingen.

Cartwright, T. C. 1971. Comparison of F_1 cows to purebreds and other crosses. Proc., Twentieth Ann. Beef Cattle Short Course. Univ. of Fla., Gainesville, Fla.

Cartwright, T. C. 1971. Effects of crossbreeding on efficiency in the feedlot. Brahman x European crosses versus other breeds. Proc. Twentieth Ann. Beef Cattle Short Course. Univ. of Fla., Gainesville, Fla.

Cartwright, T. C. 1971. Hybrid herd sires. Progressive Farmer. (In press).

Cartwright, T. C. 1971. Longevity: a valuable fertility trait. The Cattleman. 57(9):43.

Cartwright, T. C. 1971. The role of purebred breeders in crossbreeding programs. Focus on Beef 1(3):20.

Cartwright, T. C. 1971. The role of selecting and breeding to improve desirability of beef for the consumer. TAES P. R. No. 10.

Cartwright, T. C., C. R. Long and H. A. Fitzhugh, Jr. 1972. Net heterosis and complementarity in simulated beef production. J. Anim. Sci. 35: (Abstr. in press).

Fitzhugh, H. A., Jr. 1972. Beef cattle performance in the South. Proc. 6th Beef A. I. Conf. National Assn. Animal Breeders.

Fitzhugh, H. A., Jr. and St. C. S. Taylor. 1971. Predicted response to selection for degree of maturity. J. Anim. Sci. 33:199. (Abstr.)

Lindstrom, E. R. and H. A. Fitzhugh, Jr. 1971. Breed, grade and prior treatment related to performance of steers in a commercial feedlot. TAES P. R. 2970.

Long, C. R., H. A. Fitzhugh, Jr., and T. C. Cartwright. 1972. Effects of fertility and longevity in simulated beef production. J. Anim. Sci. (Abstr. in press).

Long, C. R., H. A. Fitzhugh, Jr. and T. C. Cartwright. 1971. Factors affecting efficiency of beef production. TAES P. R. 2981.

Long, C. R., T. C. Cartwright and H. A. Fitzhugh, Jr. 1972. Effects of milk yield and size in simulated beef production. J. Anim. Sci. 35: (Abstr. in press).

Schake, L. M., E. R. Lindstrom, C. R. Connor and H. A. Fitzhugh, Jr. 1971. The influence of season of year upon performance of feedlot cattle. TAES P. R.]969.

Thomas, R. C. and T. C. Cartwright. 1971. Efficiency of F_1 Angus-Jersey cows in three-way crosses. TAES P. R. 2980.

I. PROJECT: H-2102

Breeding methods for beef cattle in the southern region.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

Nat M. Kieffer (leader) and T. C. Cartwright.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Twenty-eight ewes were given post-breeding intra-uterine injections of testosterone cypionate (Upjohn). Three untreated ewes served as controls. The time intervals from breeding to treatment varied from 14 to 42 days and hormone level ranged from 10 mg to 100 mg per ewe. Eighteen ewes produced lambs and, with one exception, all ewes which were treated later than 14 days post-breeding gave birth to phenotypic males. The genetic sex was determined by chromosomal analysis, and of the 22 phenotypic males produced, 11 were genetic females. None of the genetic females which were phenotypic males had testes in their scrotums. Histological and gross physical examination has been made of the reproductive tracts of 6 of the intersex lambs. In all cases both male and female duct systems had been partially maintained and in one animal the gonad had developed as an ovotestis. In a second lamb the development of the ovary and fallopian tube had been completely inhibited, an effect not previously accomplished in placental animals with sex hormones.

Autoradiographs were analyzed from 196 XX and 173 XY cells from 13 chimeric individuals, 3 single birth controls, and a non-exchange heterosexual twin set. Cells were classified according to proportion of chromosomes incorporating radioactive DNA precursor, and sex chromosomes scored for intensity of labeling. Replicative patterns were compared for sex chromosomes of cultures leukocytes of control and chimeric origins. The Y of XY cells and the late X of XX cells were seen to follow the same internal replicative pattern in all cells, regardless of origin. However, some evidence indicated that the same set of replicative events occurred later in the synthetic period in cells of chimeric individuals compared to those of controls. Because heterosexual bovine multiple birth sets (freemartin syndrome) represent natural tissue transplants, these results have interest in the field of human medicine.

V. PLANS FOR THE FUTURE:

To adapt procedures used for revealing bands in human chromosomes to chromosomes of cattle and other domestic animals of economic importance. As pointed out by Dr. T. C. Hsu of M. D. Anderson Hospital and Tumor Institute, these newer techniques are simply marvelous. There are numerous applications to biological investigations. The induction of cross bands may well alter thinking on chromosome structure. Induction of cross bands is possibly the most feasible way of positively identifying individual chromosomes in the bovine karyotype. At present only the sex chromosomes can be identified with certainty in Bos taurus and only the X of the sex pair in Bos indicus. Identification of individual chromosome is of course the first step in mapping of chromosomes.

The investigations involving genetic-hormonal interactions in the control of sex differentiation will be extended to cattle in the Fall of 1972. Sheep will continue to be utilized as pilot animals and different androgenic hormones will be tested for their potency in influencing differentiation of sex.

VI. PUBLICATIONS:

Kieffer, Nat M. and Maurice Shelton. 1972. Hormone induced phenotypic sex reversal in lambs. J. Anim. Sci. (Abstr. in press).

I. PROJECT: S-1547

Genetics of qualitative characters in beef cattle.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

D. F. Weseli (leader), Jerry Caldwell and T. C. Cartwright.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Blood type data including red cell antigens, hemoglobin and transferrins have been collected on cattle in the cooperative S-10 herds. To date the number of animals whose blood types are on record are 1257 from Texas, 1073 from Virginia and 409 from Tennessee. These data have been punched and a program has been written for locating and printing data on individuals, sire and dam. The data will be analyzed during the coming year.

Emphasis has continued on the development of blood typing reagents. In January 1972 this laboratory participated in a comparison test with other U. S. and one Canadian blood typing laboratory. Certain deficiencies were noted in the total reagent bank; however, the present bank of typing reagents is fairly adequate. Specific reagents, particularly some in the B genetic system, are being developed.

Research concerning sex ratio control has been initiated. To date the major emphasis has been on development of techniques to identify specific enzymes in spermatozoa. Present information indicates that some enzymes are detectable in sperm cells from individual bulls. Those enzymes which have been studied are lactate, malate and glutamate dehydrogenases. Work has begun on glucose 6-phosphate dehydrogenase which is known to be sex-linked in some mammals. Present data suggest differences between bull spermatozoa for malate dehydrogenase.

V. FUTURE PLANS:

Analyses of the blood type data are planned. Work will continue on development of specific reagents. A second standarization test with other laboratories is scheduled for August or September of this year.

Texas will serve as the duty lab. Further work on the enzymatic properties of spermatozoa is planned. Isolation of certain enzymes and production of antibodies against them should be accomplished. A study of the ionic charges on the surface of sperm cells at various pH levels will be forthcoming. Cooperative analyses of data collected from the Front Royal and Tennessee herds will be given priority.

VI. PUBLICATION:

Caldwell, J., D. F. Weseli and T. C. Cartwright. 1971. Occurrence of α_1 - and β -casein types in five breeds of beef cattle. J. Anim. Sci. 32:601.

I. PROJECT: H-1583

Effects of body size and inheritance on efficiency of feed use for maintenance, activity, reproduction and milk production by mature beef cows.

II. OBJECTIVES:

To measure individual differences in feed requirements for maintenance, reproduction and milk production in mature beef cows.

To measure the effects of body size and breed on observed differences in the feed requirements for maintenance, reproduction and milk production in mature beef cows.

To measure the effects of body size and breed of dam on the total TDE and TDE per pound of calf required to produce a calf to weaning, 7 months, and to slaughter age, 12 to 13 months.

To study the relation between efficiency of feed use by each cow and efficiency of feed use of her calf.

To evaluate the results in relation to lowering the annual cost of keeping beef cows and the total cost of beef production.

III. PERSONNEL:

R. C. Thomas (leader), H. A. Fitzhugh, Jr., and T. C. Cartwright.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Mature (5 to 8 years) Hereford and Charolais cows and their progeny were individually fed in dry lot during gestation, lactation and post-lactation (progeny fed to slaughter). Cows were fed a 64% TDN ration to maintain a constant level of fleshing determined subjectively.

A principal components analysis of weight, chest depth, hook width and body length for the experimental cows yielded (1) a general size component which accounted for 75% of the generalized variance and (2) a shape component, accounting for 15% of the generalized variance, which tended to distinguish between endomorphs and ectomorphs.

The correlation of average cow weight, before, during and after lactation, with the first component was 0.93, suggesting that average weight was a good indicator of mature size.

Mature cow size, as measured by average weight, did not have a significant effect on feed consumption of the Herefords during lactation. Large cows tended to receive more total feed than smaller cows before lactation; smaller cows tended to receive more total feed than larger cows after lactation. Mature size did not significantly affect feed consumption for the Charolais cows. These unusual associations between feed consumption and mature size probably resulted from the attempt to maintain uniform fleshing condition.

Excluding the loss occurring as an immediate result of calving, average weight changes of the cows during all periods were positive. Mature size had a significant effect on weight change only during the postlactation period when there was a tendency for large cows to make small weight gains. The magnitude of the weight changes are small enough to suggest that few cows were adding body flesh.

Mean 24-hour milk yields were 5 kg per day for Herefords and 6 kg per day for Charolais. Mature cow size did not have a significant effect on milk yield within breeds, but small mature cows tended to produce more milk than larger cows.

Mature size of cows did not have a significant effect on calf birth weight, preweaning gain, preweaning feed consumption or 205-day weight of the Herefords, but did significantly affect gain and weight of Charolais calves. The trend was for calves from smaller mature cows to have larger birth weights, preweaning gains, preweaning feed consumption and 205-day weights. Average 205-day weaning weights were 261 kg for Charolais and 219 kg for Herefords. Charolais calves consumed 11% less nutrients (in feed and milk) per kg of gain than the Hereford calves.

Cows giving birth to larger calves had a slight tendency to gain less weight during the following lactation period. Calves tended to grow less rapidly and have lighter weaning weights if their dams gained more weight during the lactation period. Cows with calves making faster preweaning growth tended to make larger weight gains postlactation.

Postweaning gain, feed consumption and feed efficiency of calves were not significantly affected by mature cow size. The relationships between the postweaning characters and mature cow size were positive but very small. Charolais calves continued to gain more rapidly postweaning, but the Hereford calves gained slightly more weight per pound of feed.

Cow production efficiency, the ratio of calf weaning weight to total cow and calf feed consumption during lactation, was not significantly affected by AW, but the smaller mature cows within a breed tended to be more efficient. Production efficiency was positively associated with milk yield and negatively associated with feed consumption and weight change during lactation. Charolais cows were slightly more

efficient than Herefords. Relationships between production efficiency and calf performance traits were all positive and significant, indicating that cows having larger calves tended to be more efficient.

V. FUTURE PLANS:

This project will be terminated and incorporated in H-1936.

VI. PUBLICATIONS:

Carpenter, J. A., Jr. 1971. An evaluation of mature size in beef cattle and its relationship to production efficiency. Dissertation.

I. PROJECT: 1646

Qualitative genetic differences in cattle and pleiotropic effects.

II. OBJECTIVES:

The specific research being conducted under the above project is entitled "Characterization of the double muscle syndrome: Its genetics, anatomy, physiology, meat chemistry and carcass qualities". The objectives are:

To determine the number of gene pairs involved in the transmission of the double muscle syndrome and the degree to which modifying genes may alter the action of the basic genes involved.

To delineate all traits comprising the double muscle syndrome as to their nature, interrelationships, concomitance and effect on the overall fitness of the individual.

To elucidate muscle chemistry, physiology and meat quality.

To study musculature of double muscled animals in quest of consistent departures from normalcy other than in size. The skeletal attachments, nerve innervation and relative blood supply of the muscles will be examined in detail.

III. PERSONNEL:

N. M. Kieffer (leader) and T. C. Cartwright.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Two separate herds of cattle were utilized in the study. Herd A consisted of 14 double muscled cows representing 4 breeds. All cows in herd A were bred to double muscled bulls and each cow produced at least one calf during the 4 years of the study. Herd B was composed of 66 non-doubled muscled daughters of a bull who had previously sired double muscled calves but who was not himself double muscled. Fifty-one of these cows were mated to a bull suspected to be heterozygous for double muscling on the basis of phenotype but who was not himself double muscled. The remaining 15 cows were bred to their sire. Only one calf crop was produced by Herd B. Twenty-four calves were produced in Herd A. Although some variation occurred in the degree of perinatal muscling in these calves, by the time they were 60 days of age all of them were unmistakably double muscled. Nine of the 66 calves produced

in Herd B were double muscled. The number of double muscled calves produced in each herd corresponded closely to the number expected on the assumption that double muscling is due to a single gene. However, the double muscle gene is neither a simple Mendelian dominant or recessive since it expresses itself to a degree in the presence of its normal allele. Whether or not it is termed a partial dominant or an incomplete recessive depends upon the interpretation of theories of gene action.

V. PLANS FOR THE FUTURE:

Feedlot performance and subsequent carcass evaluation will continue into 1973 for double muscled heterozygotes and homozygotes. The first backcross matings of heterozygous females to double muscled bulls were made in the spring of 1972. Similar matings will be carried out on two additional crops of heterozygous heifers. Such matings will strengthen data already collected on the mode of inheritance of the double muscle syndrome. Studies on hormonal interrelationships with various characteristics of the double muscle syndrome may be initiated but the details are yet to be worked out.

VI. PUBLICATIONS:

Kieffer, N. M., T. C. Cartwright and J. E. Sheek. 1972. Genetic of the double muscle syndrome in cattle. *J. Anim. Sci. (Abstr. in press)*.

Swatland, H. J., R. G. Kauffman and N. M. Kieffer. 1972. Biopay detection of double muscled cattle. *J. Anim. Sci. (Abstr. in press)*.

I. PROJECT: S-1760

Beef production potential of exotic breeds and their crosses under extensive pasture conditions.

II. OBJECTIVES:

To cooperate with INTA in the analysis, interpretation and publication of data from beef breeding research in Argentina involving exotic breeds not yet widely available in the United States.

III. PERSONNEL:

H. A. Fitzhugh, Jr. (leader), T. C. Cartwright, J. E. Miller and G. E. Joandet.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Growth and carcass traits of progeny of 19 sire breeds and five dam breeds (Tables 1 and 2) were analyzed. Growth data were available for 899 steers and 531 heifers. In general, progeny of the large Continental breeds were the heaviest at birth, eight, 12 and 18 months of age. Steer progeny were slaughtered at about 450 kg liveweight. British breed sired cattle tended to be fatter and yielded lower percent lean from 9th, 10th and 11th rib dissection. Although very few in number making sampling errors probable, it was surprising that the Italian breeds tended to be relatively fat considering their previous growth records and expected mature size.

V. FUTURE PLANS:

Preliminary analyses of data will continue as records of calves from 1969 and 1970 calf crop are added. Analyses of Charolais-Angus cross data from 1960-68 calf crops are planned.

TABLE 1. LEAST SQUARE MEANS FOR WEIGHTS OF STEER PROGENY^a

Sire Breed	No.	Birth	Weight, kg		
			205	365	550
Angus	148	34.7	158	224	332
Hereford	57	36.4	169	239	351
Shorthorn	38	35.0	159	221	322
Charolais	227	42.8	181	259	382
Chianina	4	48.3	188	277	398
Romagnola	6	42.0	191	274	380
Piamontesa	4	45.0	192	261	374
Fleckvieh	45	42.5	183	259	393
Gelvieh	47	42.2	181	262	387
Black & White	31	38.6	174	264	378
Red & White	57	41.0	187	267	388
Limousin	39	39.6	173	258	363
Garronaise	48	41.6	179	259	382
Normandie	47	41.5	177	265	396
Santa Gertrudis	10	38.7	163	258	377
Brahman	9	44.7	183	278	417
Argentine Holstein	21	39.6	179	264	400
Brown Swiss	11	39.7	172	255	378
Angus x Charolais	50	38.7	171	240	357
Overall	899	40.7	177	257	377
Residual Std. Dev.		4.4	22.5	25.5	34.1

^a Dams: Angus, Hereford, Shorthorn, Charolais and Charo-Angus.

TABLE 2. LEAST SQUARE MEANS FOR SELECTED CARCASS TRAITS OF STEER PROGENY ^a

Sire Breed	No.	Pistol Cut ^b	REA ^c	Fat Thickness ^d	Kidney Fat ^b
Angus	127	44.1	67.7	1.12	2.6
Hereford	46	42.3	61.6	1.09	2.1
Shorthorn	29	43.7	60.4	1.26	2.8
Charolais	191	46.0	77.5	0.58	1.8
Chianina	3	45.6	73.3	1.08	2.8
Romagnola	5	46.6	68.0	0.64	2.1
Piamontesa	3	45.6	75.4	1.05	1.8
Fleckvieh	42	46.0	74.2	0.58	2.2
Gelbvieh	46	45.7	74.5	0.62	2.0
Black & White	31	44.9	71.1	0.96	2.4
Red & White	54	44.9	70.3	0.69	2.3
Limousin	37	45.6	79.0	0.91	2.0
Garronaise	44	46.3	77.5	0.58	1.8
Normandie	47	45.0	74.6	0.81	2.0
Santa Gertrudis	9	45.1	74.0	0.76	2.2
Brahman	9	45.2	66.3	0.87	2.2
Argen. Holstein	21	44.6	69.7	0.91	2.8
Brown Swiss	11	45.9	75.0	0.66	2.1
Angus x Charolais	47	45.5	71.6	0.69	2.1
Overall	802	45.3	71.7	0.85	2.2
Residual Standard Dev.		1.1	7.7	0.38	0.73

^aDams: Angus, Hereford, Shorthorn, Charolais, Charo-Angus.^bPercent of warm carcass weight.^cRib eye area (cm^2), 11th rib.^dAverage of two measurements (cm), 11th rib.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	A	B	H	L	J
Breed of dam	A	B	H	L	J
Line or group ¹	Purebred	Purebred	Purebred	Purebred	Purebred
Percent used in project	100	100	100	100	100
Inventory as of July 1, Age Only	Cows 2 years and over	89	22	249	8
	Yearling heifers	5	3	43	12
	Bulls and steers under 1 year	8	4	29	2
	Heifers under 1 year	10	2	33	3
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²	60	53	87	65
	Calf survival percent ³	91	89	82	70
Wean. perf.	Adj. ADG ⁴	1.8	1.6	1.7	1.6
	Ave. type sc. ⁵				1.2
Postweaning performance	No. of bulls	3	2	35	2
	No. of heifers				-
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	B	B	B	B	BS
Breed of dam	H	4X	23X	24X	1X
Line or group ¹	Crossbred	Crossbred	Crossbred	Crossbred	Crossbred
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	5	6	7	4
	Yearling heifers	10	-	-	-
	Bulls and steers under 1 year	7	-	1	-
	Heifers under 1 year	4	-	-	-
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²	96	84	81	74
	Calf survival percent ³	81	92	87	86
Wean. perf.	Adj. ADG ⁴	1.8	1.7	1.7	1.6
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls	5			
	No. of heifers				
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	G	L	L	L	A
Breed of dam	H	H	1X	57X	H
Line or group ¹	11X	15X	16X	30X	130X
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over				
	Yearling heifers				
	Bulls and steers under 1 year	4	7	-	1
	Heifers under 1 year	4	10	4	4
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²	92			
	Calf survival percent ³	90			
Wean. perf.	Adj. ADG ⁴	1.8			
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls	-	11	-	5
	No. of heifers				
	No. of steers				
Slaughtered perf.	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	BS	H	L	A	BS
Breed of dam	H	57X	15X	J	A
Line or group ¹	15X	59X	72X	105X	200X
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	31	1	2	41
	Yearling heifers	13	-	-	3
	Bulls and steers under 1 year	13	-	-	3
	Heifers under 1 year	5	-	-	2
	Bulls over 1 year				20
	Steers over 1-year				9
Repro. perf.	Percent pregnant ²	94	100	50	93
	Calf survival percent ³	76	100	100	92
Wean. perf.	Adj. ADG ⁴	1.9	1.6	1.7	1.6
Postweaning performance	Ave. type sc. ⁵				1.7
	No. of bulls	12	-	7	-
	No. of heifers				
Slaughtered performance	No. of steers				
	No. of bulls				
	No. of heifers				
Remarks	No. of steers				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	L	L	L		
Breed of dam	58X	16X	59X		
Line or group ¹	31X				
Percent used in project	100				
Inventory as of July 1,	Cows 2 years and over				
	Yearling heifers				
	Bulls and steers under 1 year				
	Heifers under 1 year				
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²				
	Calf survival percent ³				
Wean. perf.	Adj. ADG ⁴				
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls	1	1	2	
	No. of heifers				
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	BS	L	L	G	
Breed of dam	24X	A	200X	57X	
Line or group ¹					
Percent used in project					
Inventory as of July 1,	Cows 2 years and over				
	Yearling heifers				
	Bulls and steers under 1 year	2	1	2	2
	Heifers under 1 year	1	1	1	1
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²				
	Calf survival percent ³				
Wean. perf.	Adj. ADG ⁴				
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls				2
	No. of heifers				
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	G	G	H	B	B
Breed of dam	58X	200X	A	A	J
Line or group ¹	365X	385X	465X	550X	555X
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over				
	Yearling heifers				
	Bulls and steers under 1 year	2	3	-	1
	Heifers under 1 year	1	2	1	-
	Bulls over 1 year				1
	Steers over 1-year				
Repro. perf.	Percent pregnant ²				
	Calf survival percent ³				
Wean. perf.	Adj. ADG ⁴				
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls	3	-	-	-
	No. of heifers				
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	L	T	A	BS	BS
Breed of dam	105X	H	B	B	59X
Line or group ¹	260X	600X	135X	175X	190X
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	-	10	-	-
	Yearling heifers	6	-	-	1
	Bulls and steers under 1 year	10	4	1	-
	Heifers under 1 year	5	2	-	-
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²	76	78		
	Calf survival percent ³	92	84		
Wean. perf.	Adj. ADG ⁴	1.7	1.8		
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls	2			
	No. of heifers				
	No. of steers				
Slaughtered performance	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	G	T	J	T	J
Breed of dam	250X	105X	A	58X	23X
Line or group ¹	370X	605X	620X	610X	635X
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over				
	Yearling heifers				
	Bulls and steers under 1 year	-	3	8	1
	Heifers under 1 year		4	7	-
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²				
	Calf survival percent ³				
Wean. perf.	Adj. ADG ⁴				
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls	3	-	-	-
	No. of heifers				
	No. of steers				
Slaughtered	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	J	J	J	M	M
Breed of dam	B	58X	H	H	105X
Line or group ¹	630X				
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over				
	Yearling heifers				
	Bulls and steers under 1 year	-	-	19	1
	Heifers under 1 year	1	1	15	4
	Bulls over 1 year				
	Steers over 1-year				
	Repro. perf.				
Wean. perf.	Percent pregnant ²				
	Calf survival percent ³				
	Adj. ADG ⁴				
Postweaning performance	Ave. type sc. ⁵				
	No. of bulls				
	No. of heifers				
Slaughtered performance	No. of steers				
	No. of bulls				
	No. of heifers				
Remarks	No. of steers				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

State Texas

Location	McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire	M	T	M	M	T
Breed of dam	57X	57X	A	58X	23X
Line or group ¹	665X				/
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over				
	Yearling heifers				
	Bulls and steers under 1 year	3	1	1	1
	Heifers under 1 year	1	2		
	Bulls over 1 year				
	Steers over 1-year				
Repro. perf.	Percent pregnant ²				
	Calf survival percent ³				
Wean. perf.	Adj. ADG ⁴				
	Ave. type sc. ⁵				
Postweaning performance	No. of bulls				
	No. of heifers				
	No. of steers				
Slaughtered	No. of bulls				
	No. of heifers				
	No. of steers				
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning.

The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

Breed and Cross CodeTex. 31
124

A	Angus
B	Brahman
L	Charolais
H	Hereford
J	Jersey
M	Limousin
T	Simmental
BS	Brown Swiss
G	Santa Gertrudis
1x	$\frac{1}{2}$ B - $\frac{1}{2}$ H
11x	$\frac{1}{2}$ G - $\frac{1}{2}$ H
15x	$\frac{1}{2}$ L - $\frac{1}{2}$ H
16x	$\frac{1}{2}$ L - $\frac{1}{4}$ H - $\frac{1}{4}$ B
30x	$\frac{1}{2}$ L - $\frac{1}{4}$ BS - 1/8 H - 1/8 B
31x	$\frac{1}{2}$ L - $\frac{1}{4}$ BS - $\frac{1}{4}$ H
57x	$\frac{1}{2}$ BS - $\frac{1}{4}$ H - $\frac{1}{4}$ B
58x	$\frac{1}{2}$ BS - $\frac{1}{2}$ H
59x	$\frac{1}{4}$ BS - 5/8 H - 1/8 B
4x	3/4 B - $\frac{1}{4}$ H
23x	7/8 B - 1/8 H
24x	15/16 B - 1/16 H
72x	3/4 L - $\frac{1}{4}$ H
82x	3/4 L - 1/8 H - 1/8 B
105x	$\frac{1}{2}$ A - $\frac{1}{2}$ J
130x	$\frac{1}{2}$ A - $\frac{1}{2}$ H
135x	$\frac{1}{2}$ A - $\frac{1}{2}$ B
175x	$\frac{1}{2}$ BS - $\frac{1}{2}$ B
190x	5/8 BS - 5/16 H - 1/16 B
200x	$\frac{1}{2}$ BS - $\frac{1}{2}$ A
230x	$\frac{1}{2}$ BS - 3/8 B - 1/8 H
250x	$\frac{1}{2}$ L - $\frac{1}{2}$ A
260x	$\frac{1}{2}$ L - $\frac{1}{4}$ A - $\frac{1}{4}$ J
270x	$\frac{1}{2}$ L - $\frac{1}{4}$ BS - $\frac{1}{4}$ A
290x	$\frac{1}{2}$ L - 1/8 BS - 5/16 H - 1/16 B
355x	$\frac{1}{2}$ G - $\frac{1}{4}$ BS - 1/8 H - 1/8 B
365X	$\frac{1}{2}$ G - $\frac{1}{4}$ BS - $\frac{1}{4}$ H
370x	$\frac{1}{2}$ G - $\frac{1}{4}$ L - $\frac{1}{4}$ A
385x	$\frac{1}{2}$ G - $\frac{1}{4}$ A - $\frac{1}{4}$ BS
465x	$\frac{1}{2}$ H - $\frac{1}{2}$ A
550x	$\frac{1}{2}$ B - $\frac{1}{2}$ A
555x	$\frac{1}{2}$ B - $\frac{1}{2}$ J
600x	$\frac{1}{2}$ T - $\frac{1}{2}$ H
605x	$\frac{1}{2}$ T - $\frac{1}{4}$ A - $\frac{1}{4}$ J
610x	$\frac{1}{2}$ T - $\frac{1}{4}$ BS - $\frac{1}{4}$ H
620x	$\frac{1}{2}$ J - $\frac{1}{2}$ A
625X	$\frac{1}{2}$ J - $\frac{1}{2}$ H
630x	$\frac{1}{2}$ J - $\frac{1}{2}$ B
635x	$\frac{1}{2}$ J - 3/8 B - 1/8 H
645x	$\frac{1}{2}$ J - $\frac{1}{4}$ BS - $\frac{1}{4}$ H
650x	$\frac{1}{2}$ M - $\frac{1}{2}$ H
655X	$\frac{1}{2}$ M - $\frac{1}{4}$ J - $\frac{1}{4}$ A
665X	$\frac{1}{2}$ M - $\frac{1}{4}$ BS - 1/8 H - 1/8 B
670x	$\frac{1}{2}$ T - $\frac{1}{4}$ BS - 1/8 H - 1/8 B
675x	$\frac{1}{2}$ M - $\frac{1}{2}$ A
680x	$\frac{1}{2}$ M - $\frac{1}{4}$ BS - $\frac{1}{4}$ H
685x	$\frac{1}{2}$ T - 5/16 B - 1/16 H

VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY
ANIMAL SCIENCE DEPARTMENT
BLACKSBURG, VIRGINIA

I. PROJECT: 206100 (S-10)

Heterosis from Crosses among British Breeds of Beef Cattle.

II. OBJECTIVES:

To measure heterosis obtained from crosses among the Angus, Hereford, and Shorthorn breeds, as shown by fertility and livability, growth rate, fattening ability and carcass quality.

To compare straightbred cows with crossbred cows on the basis of lifetime production.

III. PERSONNEL:

M. B. Wise, F. S. McClaugherty, J. S. Copenhaver, J. P. Fontenot, R. C. Carter, W.H. McClure, J. A. Gaines.

IV. ACCOMPLISHMENTS DURING THE YEAR:

The objective of the phase of the experiment to be reported here is to compare straightbred calves from straightbred dams with crossbred calves from crossbred dams. This is a continuation of previously reported results from crossing the Angus, Hereford and Shorthorn breeds, and it is preliminary to results comparing straightbreeding with rotational crossbreeding. The cow herd consisting of sixty straightbreds (Angus, Hereford and Shorthorn), and sixty crossbreds (reciprocal two-breed crosses) among these three breeds, was purchased as calves in 1960. The first five calf crops were used to compare straightbred and crossbred cows, and the results have been reported previously. The 6th, 7th, 8th and 9th calf crops will be used to compare straightbred calves with three-breed cross calves out of two-breed cross dams. Results from the four calf crops through weaning are complete and will be reported here:

203 straightbred matings weaned 167 calves (82.3%).

211 crossbred matings weaned 199 calves (94.3%).

	Steers		Heifers	
	Straight	Cross	Straight	Cross
No. of calves weaned ¹	82	98	87	100
Weaning wt.	486	537	460	500
Feeder gr. at wean. ³	12.0	12.5	11.7	12.3
No. of calves fed ²	64	79		
ADG on feed	2.08	2.12	Previously	
Slaughter wt.	924	985	Reported	
Slaughter gr. ³	12.1	12.2		
Carcass wt. ³	545	582		
Carcass gr. ³	12.0	11.7		
Dressing %	59.0	59.1		
Loin eye area, sq. in.	10.1	10.8		

¹ Four calf crops to weaning.

² Three calf crops of steers and one crop of heifers, postweaning.

³ Grade code: 11, Good plus, 12, Choice minus.

There are large differences in percent weaned, birth weight, weaning weight, slaughter weight and carcass weight. Differences in quality, as measured by feeder grade, slaughter grade, and carcass grade are negligible.

First calf crop of phase three is now on the ground.

V. FUTURE PLANS:

Phase three will proceed according to plan.

VI. PUBLICATIONS:

Gaines, J. A., G. V. Richardson R. C. Carter and W. H. McClure. 1971. General combining ability and maternal effects in crossing three British breeds of beef cattle. Va. Journal of Sci. 22:82 (Abstr.).

Gaines, J. A., R. C. Carter, W. H. McClure and C. Hill. 1971. Purebred versus crossbred cows of three beef breeds. J. Anim. Sci. 33:200. (Abstr.)

Gaines, J. A., R. C. Carter, W. H. McClure and E. A. Tolley., 1971. Straightbreeding versus crossbreeding of beef cattle. J. Anim. Sci. 33:200. (Abstr.).

State Virginia

		SVRS	R.B. Dunlap
Location		Steeles Tavern, VA.	Cooperator
Breed of sire	var.		var.
Breed of dam	var.		var.
Line or group ¹	pure & cr.		pure & cr.
Percent used in project	95		100
Inventory as of July 1, 1972			
Cows 2 years and over	120		98
Yearling heifers	---		---
Bulls and steers under 1 year	---		---
Heifers under 1 year	---		---
Bulls over 1 year	12		2
Steers over 1-year	---		---
Repro. perf.	Percent pregnant ²		
	Calf survival percent ³		
Wean. perf.	Adj. ADG ⁴		
	Ave. type sc. ⁵		
Postweaning performance	No. of bulls		
	No. of heifers		
	No. of steers	40	
Slaughtered	No. of bulls		
	No. of heifers		
	No. of steers	47	
Remarks			

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

BEEF CATTLE RESEARCH STATION
Front Royal, Virginia

I. PROJECT: CRIS Unit 03 30 019 313a 49

Breeding superior beef cattle for Virginia

II. OBJECTIVES:

To compare changes in performance and breeding values from two breeding systems: (a) single trait mass selection, and (b) the formation of intensely inbred lines for subsequent use in top and rotational crossing.

To evaluate selection criteria and procedures and to develop more precise and effective measures of quality and performance in beef cattle.

To simplify methods of individual, progeny and sib testing so that the performance of breeding cattle can be evaluated at young ages.

III. PERSONNEL:

B. M. Priode, K. P. Bovard, M. B. Wise, R. C. Carter, P. A. Putnam and W. T. Butts, Jr.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

During the year, the second of four years' diallel cross calves were compared with inbreds and growth selection calves.

The previous two years' studies of reproductive development -- age at first heat -- were continued with 95 heifer calves on post-weaning tests. Daily heat checks were discontinued, but a monthly schedule of rectal palpation to detect onset of puberty began in January, directed by Dr. T. N. Meacham of VPI.

In the Mule Stable barn, twenty lots, about 10' x 20', each, were made, using surplus property, for feeding of steers in a digestible energy intake study, directed by Dr. David Dinius of ASRD, Beltsville, Maryland.

2. Research results:

Terramycin supplement reduces scours. In a cooperative study with Pfizer, 40 cows and their calves in confinement were studied from mid-January through mid-May. Half received supplemental Terramycin, Pfizer additive TM-10, at the rate of one gram per day. All calves were scored daily for apparent incidence and severity of scours, and for concomitant weakness. Laboratory tests of fecal samples were negative from apparently affected calves and from those believed healthy. Calves from cows receiving TM-10 showed less scours and slightly less weakness than did calves from untreated cows. Results are shown in Table 1 below:

TABLE 1. CALF VITALITY SCORES
MARCH 2, - MAY 9, 1971

Dams' treatment	No. calf days	Ave. scores ^a	
		Weakness	Scours
Control	875	0.046	0.494
Treated	882	0.022	0.303
Total or ave.	1757	0.034	0.398

^aWeakness and scours scored such that 1 = slight; 2 = moderate; and 3 = severe.

1972 calf crop. Fall palpation results and estimated conception rates, table attached, had some bad news and some good. Overall conception rate was 78%, poorest since 1960 when all cows were bred artificially. Good news was finding 25/26 (96.2%) linecross yearling heifers pregnant; and 14/16 (87.5%) pregnant to yearling Shorthorn bull 0076 S-8, a bull found when semen samples were taken in mid-August after breeding season to have an abnormal growth (adhesions) on his penis believed then to have adversely affected, if not precluded, natural service. Further, the bull was not seen breeding a cow during the pasture breeding season, thus this was a pleasant surprise.

Clinicians Bond and Meacham differed slightly in the proportion of pregnant cows that were classified medium and large, Table 2. This criterion has been useful in previous years for sorting cows into winter feeding groups, later used to estimate expected calving dates.

TABLE 2. PREGNANCY DIAGNOSES BY CLASS AND SIZE, AGE OF COW, AND CLINICIAN, OCTOBER 1971

Diagnosis by	Age of cow, yrs.	Open	Pregnant			Total
			Small	Medium	Large	
Bond	1	1	5	18	5	29
	>2	45	22	64	24	155
	Total	46	27	82	29	184
Meacham	1	6	6	19	10	41
	>2	27	23	45	46	141
	Total	33	29	64	56	182
Total	1	7	11	37	15	70
	>2	72	45	109	70	296
	Total	79	56	146	85	366

V. FUTURE PLANS:

Continuation of diallel testing is planned for two more calf crops, comparing purebred linecross, inbred and growth selection calves in Angus and Shorthorn.

Yearling and two-year-old singlecross heifers will be bred to an inbred bull of a third line.

Pinkeye studies, cooperative with Veterinary Science, Entomology and Animal Science at VPI, have been approved, to be initiated in June 1972.

VI. PUBLICATIONS:

Bovard, K. P., J. P. Fontenot and B. M. Priode. 1971. Accumulation and dissipation of heptachlor residues in fattening steers. J. Anim. Sci. 33:127.

Bovard, K. P., T. N. Meacham and B. M. Priode. 1971. Patterns of growth, fattening and reproductive development of heifer calves to one year. Paper presented at Virginia Academy of Science Meetings, Blacksburg, Va., May 13-14, 1971. Va. Journal Sci. 22:81. (Abstr.).

Bovard, K. P., R. L. Wilson and B. M. Priode. 1971. Breed and sex differences in means and repeatabilities of ultrasonic readings of hide and fat thickness in beef calves 6 - 12 months old. Paper presented at Virginia Academy of Science Meetings, Blacksburg, Va. May 13-14, 1971. Va. Journal Sci. 22:81.(Abstr.)

Bovard, K. P., N. W. Hooven and B. M. Priode. 1971. Effects of timing and breeding on legibility of breeze brands in beef heifers. Paper presented at Virginia Academy of Science Meetings, Blacksburg, Va., May 13-14, 1971. Va. Journal Sci. 22:81. (Abstr.).

Bovard, K. P., F. D. Griffith and B. M. Priode. 1971. Variation in seven pesticide residues in apple pomace. Paper presented at Virginia Academy of Science Meetings, Blacksburg, Va., May 13-14, 1971. Va. Journal Sci. 22:80. (Abstr.).

Smith, K. P. 1971. Predicting topcrossing performance of inbred and selection lines of beef cattle. Ph.D. Dissertation, VPI and SU Library Blacksburg, Virginia.

Scarsi, J. C. 1971. Effects of inbreeding and estimates of genetic progress upon preweaning traits in beef cattle. Ph.D. Dissertation, VPI and SU Library, Blacksburg, Virginia.

VII. PUBLICATIONS PLANNED:

Rumsey, T. S., R. R. Oltjen, K. P. Bovard and B. M. Priode. 1972. Influence of widely diverse finishing regimens and breeding on depot fat composition in beef cattle. J. Anim. Sci. (In press)

Bovard, K. P., E. Jones and B. M. Priode. 1972. Relationship of calving difficulty in beef cattle to subsequent performance of cow and calf. Va. Journal Sci. (In press). Abstract.

Rumsey, T. S., R. R. Oltjen, K. P. Bovard and B. M. Priode. 1972. Diet and breeding influences on fat composition in cattle. J. Anim. Sci. (In press) Abstract.

Hooven, N. W., Jr., C. DeGeer and K. P. Bovard. 1972. A comparison of ear tag types to identify beef cattle. J. Anim. Sci. (In press) Abstract.

Kiddy, C. A., K. P. Bovard and L. R. Miller. 1972. Milk polymorphisms and growth of beef calves. (In press).

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal	Front Royal	Front Royal	Front Royal	Front Royal	
Breed of sire	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	
Breed of dam	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	
Line or group ¹	045-054	Three-Line Cross	008	009	Total	
Percent used in project	100	100	100	100	100	
Inventory as of July 1,	Cows 2 years and over	-	-	53	-	159
	Yearling heifers	4	-	16	-	41
	Bulls and steers under 1 year	3	2	13	10	47
	Heifers under 1 year	1	3	23	10	58
	Bulls over 1 year	1	-	7	-	21
	Steers over 1-year	-	-	-	-	-
	Percent pregnant ²	58.3	-	95.6	-	77.0
Repro. perf.	Calf survival percent ³	85.7	-	86.0	-	85.7
	Adj. ADG ⁴	1.79	-	1.97	-	1.78
Wean. perf.	Ave. type sc. ⁵	12.5	-	12.0	-	11.7
Postweaning performance	No. of bulls	2	-	14	-	33 *
	No. of heifers	4	-	16	-	41
	No. of steers	-	-	-	-	-
Slaughtered performance	No. of bulls	-	-	-	-	-
	No. of heifers	-	-	-	-	-
	No. of steers	-	-	-	-	-
Remarks	* Plus 2 outside bulls on ROP					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Breed of dam	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Line or group ¹	012-021	014-041	015-051	024-042	025-052
Percent used in project	100	100	100	100	100
Inventory as of July 1, Repro. perf.	Cows 2 years and over	-	4	2	4
	Yearling heifers	3	6	-	-
	Bulls and steers under 1 year	4	-	1	9
	Heifers under 1 year	4	-	1	3
	Bulls over 1 year	1	-	-	-
	Steers over 1-year	-	-	-	-
	Percent pregnant ²	75.0	76.9	-	63.6
Wean. perf.	Calf survival percent ³	100.0	100.0	-	71.4
	Adj. ADG ⁴	1.71	1.80	-	1.75
	Ave. type sc. ⁵	11.6	11.7	-	11.4
Postweaning performance	No. of bulls	5	3	-	2
	No. of heifers	3	6	-	3
	No. of steers	-	-	-	-
Slaughtered	No. of bulls	-	-	-	-
	No. of heifers	-	-	-	-
	No. of steers	-	-	-	-
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning.

The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Breed of dam	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Line or group ¹	001	002	004	005	007
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	22	22	32	18
	Yearling heifers	1	5	2	1
	Bulls and steers under 1 year	0	1	4	0
	Heifers under 1 year	4	4	5	0
	Bulls over 1 year	3	3	3	2
	Steers over 1-year	-	-	-	-
	Percent pregnant ²	77.8	90.9	72.7	27.3
Repro. perf.	Calf survival percent ³	50.0	90.9	87.5	100.0
	Adj. ADG ⁴	1.48	1.43	1.60	1.46
Wean. perf.	Ave. type sc. ⁵	11.2	10.4	11.7	11.9
Postweaning performance	No. of bulls	2	1	3	1
	No. of heifers	1	5	2	1
	No. of steers	-	-	-	-
Slaughtered performance	No. of bulls	-	-	-	-
	No. of heifers	-	-	-	-
	No. of steers	-	-	-	-
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.

² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

⁴ Indicate adjustments:

⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal	Front Royal	Front Royal	
Breed of sire	Hereford	Hereford	Hereford	
Breed of dam	Hereford	Hereford	Hereford	
Line or group ¹	008	009	Total	
Percent used in project	100	100	100	
Inventory as of July 1,	Cows 2 years and over	34	-	34"
	Yearling heifers	-	11	11"
	Bulls and steers under 1 year	13	-	13
	Heifers under 1 year	13	-	13
	Bulls over 1 year	4	2	6"
	Steers over 1-year	-	-	-
Repro. perf.	Percent pregnant ²	-	77.1	77.1
	Calf survival percent ³	-	92.6	92.6
Wean. perf.	Adj. ADG ⁴	-	1.77	1.77
	Ave. type sc. ⁵	-	11.8	11.8
Postweaning performance	No. of bulls	-	4	4"
	No. of heifers	-	11	11"
	No. of steers	-	-	-
Slaughtered	No. of bulls	-	-	-
	No. of heifers	-	-	-
	No. of steers	-	-	-
Remarks				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal	Front Royal	Front Royal	Front Royal	
Breed of sire	Angus	Angus	Angus	Angus	
Breed of dam	Angus	Angus	Angus	Angus	
Line or group ¹	034-043	Three-Line Cross	008	Total	
Percent used in project	100	100	100	100	
Inventory as of July 1,	Cows 2 years and over	-	-	39	164"
	Yearling heifers	4	-	12	43"
	Bulls and steers under 1 year	2	6	21	60
	Heifers under 1 year	9	6	18	67
	Bulls over 1 year	1	-	4	16"
	Steers over 1-year	-	-	-	-
	Percent pregnant ²	92.3	-	96.4	87.9
Reprod. perf.	Calf survival percent ³	91.7	-	92.6	87.9
	Adj. ADG ⁴	1.89	-	2.02	1.81
Wean. perf.	Ave. type sc. ⁵	12.0	-	12.5	11.7
Postweaning performance	No. of bulls	6	-	13	46 *
	No. of heifers	4	-	12	43
	No. of steers	-	-	-	-
Slaughtered performance	No. of bulls	-	-	-	-
	No. of heifers	-	-	-	-
	No. of steers	-	-	-	-
Remarks	* Plus 3 outside bulls on ROP				

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire	Angus	Angus	Angus	Angus	Angus
Breed of dam	Angus	Angus	Angus	Angus	Angus
Line or group ¹	001	002	003	004	006
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	30	31	20	29
	Yearling heifers	2	3	2	4
	Bulls and steers under 1 year	7	5	4	1
	Heifers under 1 year	6	2	3	4
	Bulls over 1 year	3	2	2	2
	Steers over 1-year	-	-	-	-
Repro. perf.	Percent pregnant ²	84.6	85.7	81.8	80.0
	Calf survival percent ³	72.7	91.7	77.8	87.5
Wean. perf.	Adj. ADG ⁴	1.59	1.65	1.50	1.68
	Ave. type sc. ⁵	11.1	11.1	10.1	11.1
Postweaning performance	No. of bulls	3	4	3	3
	No. of heifers	2	3	2	4
	No. of steers	-	-	-	-
Slaughtered performance	No. of bulls	-	-	-	-
	No. of heifers	-	-	-	-
	No. of steers	-	-	-	-
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire	Angus	Angus	Angus	Angus	Angus
Breed of dam	Angus	Angus	Angus	Angus	Angus
Line or group ¹	012-021	013-031	014-041	023-032	024-042
Percent used in project	100	100	100	100	100
Inventory as of July 1,	Cows 2 years and over	-	3	5	2
	Yearling heifers	6	5	-	-
	Bulls and steers under 1 year	6	-	3	5
	Heifers under 1 year	7	-	4	8
	Bulls over 1 year	-	-	-	-
	Steers over 1-year	-	-	-	-
	Percent pregnant ²	86.7	76.9	-	-
Repro. perf.	Calf survival percent ³	92.3	90.0	-	-
	Adj. ADG ⁴	1.76	1.88	-	-
Wean. perf.	Ave. type sc. ⁵	12.0	11.6	-	-
Postweaning performance	No. of bulls	5	4	-	-
	No. of heifers	6	5	-	-
	No. of steers	-	-	-	-
Slaughtered performance	No. of bulls	-	-	-	-
	No. of heifers	-	-	-	-
	No. of steers	-	-	-	-
Remarks					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1971-72

State Virginia

Location	Front Royal				
Breed of sire	Purebred				
Breed of dam	Purebred				
Line or group ¹	Herd Total				
Percent used in project	100				
Inventory as of July 1,	Cows 2 years and over	357			
	Yearling heifers	95			
	Bulls and steers under 1 year	120			
	Heifers under 1 year	138			
	Bulls over 1 year	43			
	Steers over 1-year	-			
Repro. perf.	Percent pregnant ²	-			
	Calf survival percent ³	-			
Wean. perf.	Adj. ADG ⁴	-			
	Ave. type sc. ⁵	-			
Postweaning performance	No. of bulls	83 *			
	No. of heifers	95			
	No. of steers	-			
Slaughtered	No. of bulls	-			
	No. of heifers	-			
	No. of steers	-			
Remarks * Plus 5 outside bulls on ROP					

¹ Purebreds, grade, line, sire number, crosses, treatment, etc.² Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.³ Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.⁴ Indicate adjustments:⁵ Suggest S-10 scoring system; indicate if different.

